

December

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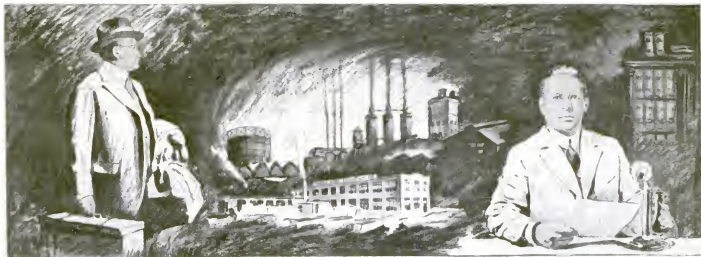
Emanuel Rushfeldt, Alberta, says: "Earning \$10 a day and only 20 years old."



W. W. Peace gets \$250 a month and expenses operating a tractor in the oil fields.



Louis Beimer at 24 was made foreman over men many years older. That's not luck—it's Rahe training.



In three short years he put it across

*But he had dreamed about it for fourteen years.
Haven't YOU dreamed long enough?*

THIS is a story for salesmen; for accountants; for technical men—for any man who knows one department of business, and wonders how he is going to get to the top, either in the business where he now is, or in a business of his own.

It has to do with a man named R. Lee Smith, now Vice-President and General Manager of the United Soda Fountain Company of Boston; one of the most successful concerns of its kind in the country.

For fourteen years he worked and dreamed; then he added the training of the Alexander Hamilton Institute to his work.

And in three short years he had made the dreams of fourteen years come true.

Thirty-eight; married; and a family

Starting as a salesman he became sales manager of a company making soda fountains and their equipment. He was successful in his department—sales. (Most men who enrol with the Institute are successful in the one department of business where their experience has been gained.) He was thirty-eight. (Most men who enrol with the Institute are between twenty-five and forty-

five.) He was married. (A majority of the men who enrol with the Institute are.)

And this was the driving power behind his decision: "I wished to afford my family advantages," he wrote, "*which otherwise they would not have had.*"

"I had dreamed for years of my own business"

"For fourteen years I had been a salesman and sales manager," he continued. "I had dreamed for years of my own business organization, but my work gave me no understanding of business other than that which concerned selling.

"I knew nothing of production, financing, or business promotion. Your Course and Service gave me an understanding of these things."

He clipped a coupon from an advertisement like this. With the knowledge which the Institute brought to him, and with its encouragement and guidance, he organized the United Soda Fountain Company, erected a factory and started production. Straight thru the period of business depression the business has steadily grown; and now Mr. Smith plans to double its factory space and its output.

So three years' work with training did what work alone had never been able to do.

A book that has made dreams come true

You who read Mr. Smith's story on this page are already familiar with the Alexander Hamilton Institute. You know how many thousand men there are who, like Mr. Smith, give it credit for having shortened their path to larger income and greater success.

The whole story of the Institute has been printed fully in a 118-page book—a book that should be in every thoughtful man's library. It is called

"Forging Ahead in Business"

For any man who is asking himself "Where am I going to be in business ten years from now?" there is a copy of this book without obligation. We would like to place it in the hands of every ambitious man. It helped Mr. Smith to give his family "advantages that otherwise they would not have had." Send for your copy now.

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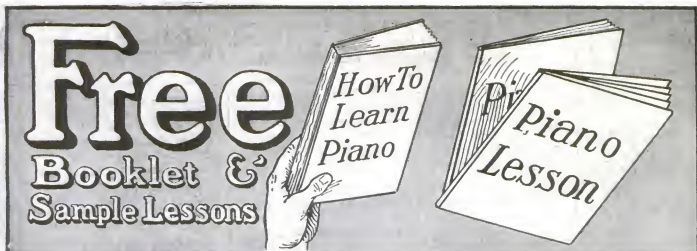
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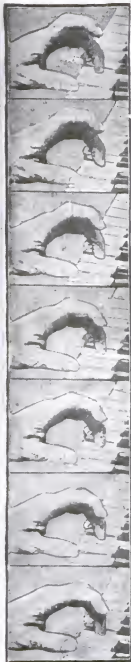


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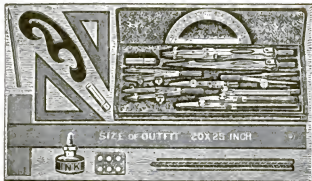
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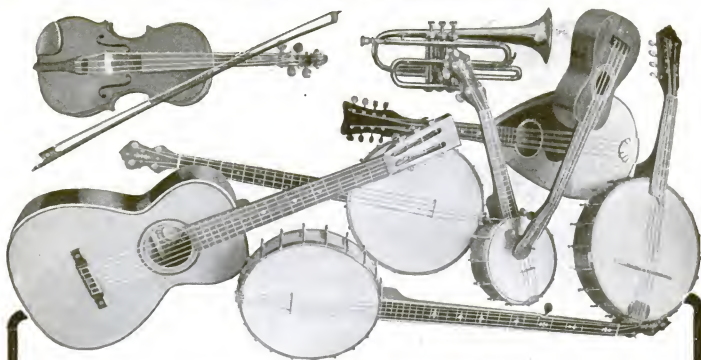
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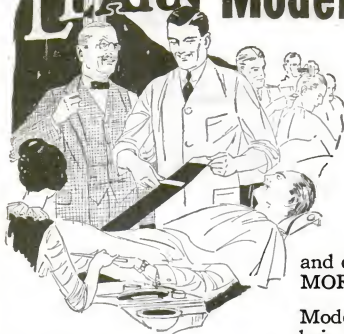
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According to the chemists, a man contains enough water to wash a pair of blankets, enough lime to whitewash a chicken-coop, enough phosphorus to make a thousand matches, and enough sulphur to kill the fleas on one dog. All this material can be bought at a drug-store at the junk price of 98 cents.

On the other hand, a man weighing 150 pounds, if all gold, would be worth \$20.75 per Troy ounce or about \$50,000, which at six per cent. interest has an earning power of \$3,000 a year, almost \$60 a week.

Are you junk or gold? Many thousands of other men are proving themselves worth their weight in gold, or much more. They rise to this value by developing their Bigger Selves, by storing their minds with useful education.

Let us tell you, free of charge, how we are helping ambitious young men to become "worth their weight in gold" during their evening spare hours, through a new kind of correspondence instruction that brings "the most service for the least money." You can't afford not to avail yourself of this friendly counsel. Mark and mail the coupon.

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Without obligating me, please advise regarding the course in

Name.....

Full Address.....

(Please write plainly.)

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Endorsed as the official training school for leading Commercial Art houses, employing hundreds of artists. Correct educational methods applied. A practical educator and a corps of top notch commercial artists, offer students the benefit of 20 to 30 years of high grade experience. Only the best instruction is good enough for you. Students finishing half of this unusual course can secure and hold desirable positions. Course can be made to pay for itself many times while studying. Either *class room or home study* instruction. *Some course. Some credits.* If you like to draw, let's talk it over. Ask for our book telling all about Commercial Art and the opportunities it presents AS WE TEACH IT. Send 6 cents in stamps for postage.

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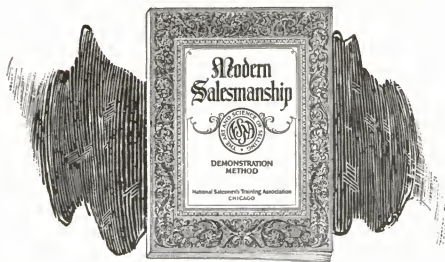


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Name.....
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NOW FREE!

The Book That Has Shown Thousands the Way to Amazing Salary Increases

Do you want to leave the rut of routine work and start right out making more money than you ever dreamed possible? We have done exactly this for thousands of men. Here is the book which gave them their start. Read how it is now offered to you—FREE!

TAKE this situation: A man who had worked all his life in a routine job at low pay suddenly surprises his friends, by moving into a better neighborhood, taking a big house, buying a car and blossoming out as a well-to-do and influential citizen in his new community. How did he do it? What is the secret that he used? Simple enough. He knew that the biggest money in business is in Selling, and though he felt that he couldn't sell a thing, he suddenly learned the secrets that make Master Salesmen and then began to make big money.

If only one man had found inspiration enough in this remarkable book to jump to a sudden brilliant success in the Selling field—in to a job paying him many times his former salary—then you might call it luck. But thousands have done it.

READ!

Charles Boery of Winterset, Iowa, stepped from \$18 a week as a clerk to a position making him \$1,000 the very first month. J. P. Overstreet of Dennison, Texas, read this amazing book, left a job on the Capital Police Force at a salary of less than \$1,000 a year and in six weeks earned \$1,800. F. Wynn, Portland, Ore., an ex-service man, earned \$554.37 in one week. Geo. W. Kearns of Oklahoma City found in this book a way to jump his earnings from \$66.00 a month to \$24.00 in two weeks, and C. W. Campbell learned from it how he could quit a clerking job on the railroad to earn \$1,632 in thirty days.

Your One Chance to Make the Biggest Money of Your Life

Not one of the men whose names appear in the panel at left had ever sold a thing before—not a dime's worth. Yet every one of these men through reading this book discovered an amazingly easy way to jump suddenly from low pay to extraordinary earnings in the selling field.

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tion—certain ways to stimulate keen interest—certain ways to overcome objections, batter down prejudices, outwit competition and make the prospects act.

Simple as A B C

"Modern Salesmanship" tells exactly how the National Salesmen's Training Association will teach you these principles in your spare time at home.

As soon as you are qualified and ready, the Association's Employment Service helps you to select and secure a selling position as city or traveling salesman.

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This may be the one big chance of your life to leave forever behind you the low pay of a routine job for a sudden, brilliant success at a big salary.

Is it worth 2c to find out? Then mail this coupon NOW.

National Salesmen's Training Association Dept. 12-W, Chicago, Illinois

National Salesmen's Training Association
Dept. 12-W, Chicago, Ill., U. S. A.

Please send me, without any obligation on my part, your free book, "Modern Salesmanship," and full information about the N. S. T. A. system of Salesmanship Training and Employment Service. Also a list showing lines of business with openings for salesmen.

Name

Street

City..... State.....

Age..... Occupation.....



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the valuable knowledge that it has taken some of the most successful hotel men years to obtain—men who are now making \$5,000 to \$50,000 a year. All your training will be under the personal direction of CLIFFORD LEWIS—a hotel expert of national reputation. Endorsed by managers of such hotels as Waldorf-Astoria, Baltimore, Copley-Plaza, New Willard, St. Francis. A few spare-time hours a week given to the simple, clear lessons of the Course open the way to a good position, a fine living, and a handsome salary. The training will in no way interfere with your present activities.

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Students may also take a complete course covering every phase of battery repair and building. This course offers unusual earning possibilities.

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Michigan State

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5,400 MOTORS DAILY TO BE FORD OUTPUT

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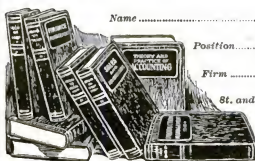
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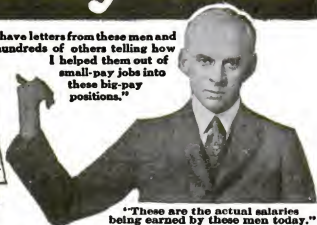
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"AUTHENTIC Life of Henry Ford"—Amazing, thrilling, fastest-selling samples free. \$100 weekly easy. Free outfit. Hertel Co., 9 So. Clinton, Chicago.

AGENTS: Big profits. Best and cheapest window letters made. Easily applied. Dime brings five samples. Particulars free. Stalbritte Co., 111 Second Ave., New York.

A BUSINESS of Your Own—Make sparkling glass name plates, numbers, check-boards, medallions, signs; big illustrated book free. E. Palmer, 511, Wooster, O.

AGENTS make 500% profit handling Auto Monograms, New Pictures, Window Letters, Transfers, Novelty Signs, Catalog Free. Write Hinton Co., Star City, Ind.

POLISHING Cloth—easy seller, big money. Hundred other tlop specialties. Get this proposition. Address Newton & Co., 82 Main Street, Newark, N. Y.

EVERYBODY uses extracts. Sell Duo Double Strength Extracts. Complete line household necessities. Big repeaters. Write today. Duo Co., Dept. Et, Adick, N. Y.

HOUSEHOLD and office necessity, endorsed by "Good Housekeeping." An article of daily use. Large profits. Everett & Barron Co., Providence, R. I.

LIVE Agents. Every call a sale. Act quick. Best seller on market today. 100% profit. Sybil Laboratories, 514 Marquette Bldg., Chicago.

AGENTS—Make 100%. Toilet articles, Perfumes, Extracts, Household necessities. Sample Case Free. Laderma Co., Dept. A, Main and Walnut, St. Louis, Mo.

BIG Agent's and Mail Order Magazine of Opportunities and Information, including "Supply" Guide; three months, 25c. Harvey Teeple, Decatur, Indiana.

LARGE manufacturer wants agents to sell guaranteed made to measure raincoats, Gabardine and Reversible top and raincoat combined. Make \$75 to \$100 weekly. Profit in advance. We deliver and collect. Outfit free. Standard Raincoat Co., 165 West 24th Street, New York.

BIG Profits Selling New \$3.50 Automatic Adding Machine. Absolutely accurate. Fully guaranteed. Quick sales. Ten daily easy. No competition. Pocket size. Business people everywhere. Thousands being sold. Tremendous demand. Here's high-grade money-maker. Bassett Co., 1458-L, Hollywood Ave., Chicago.

AGENTS. Distributors, Energetic men every city, earn \$50 to \$100 weekly selling new line household specialties. Start at once; large demand; sell on sight. Big Three Money-Maker sent free; selling instructions, folders, literature. The Fernald Company, North East, Pa.

AGENTS—\$1.25 an hour spare time special advertising and showing samples. Get our big sample assortment free. Tea, coffee, spices, candies, baking powder, food products, things people eat, 250 fast sellers. Big profits. Exclusive territory. Dept. 30, Harley Company, Dayton, Ohio.

PATENTS—Write for our free illustrated guide book and Evidence of Conception Blank. Send sketch of model for our opinion of its patentable nature free. Highest references. Prompt attention. Reasonable terms. Victor J. Evans & Co., 168 Ninth, Washington, D. C.

If you need good live agents—fellows who can get the business—ask me how others are doing it. I'll gladly render the necessary assistance. J. Roy McClellan, Mgr. Classified Advertising, Popular Mechanics Magazine, Chicago.

EASY, pleasant work for Mechanics, Shop Men, etc., during spare hours; will add many dollars to their salaries. Also want persons who can give full time. Big wages assured. Novelty Cutlery Co., 67 Bar St., Canton, O.

AGENTS: Get your money on the spot, \$16 daily demonstrating Sereolas. No waiting for commission or salary checks. No delivering. No collecting. Big money just starting. Write or wire. Perry Ludlow Co., 8-1862, Dayton, Ohio.

AGENTS make \$10 daily—Big line guaranteed extracts, food products, perfumes, toilet goods, household necessities. No capital or experience needed. Free sample case and instructions. Write for amazing offer. Perkins Products Co., Desk 6, Hastings, N. Y.

CLARKE made \$18 an hour selling vest-pocket windshield cleaner needed by every autoist, motorman, engineer; one rub keeps glass clear 24 hours; 60,000 sold; amazing proposition free. Security Mfg. Co., Dept. 627, Toledo, Ohio.

AGENTS—Enormous profits selling Genuine Gold Leaf sign letters. Guaranteed not to fail. Establish a permanent business or travel. Anybody can do it. Free samples. Guarantee Sign Service, A 430 South California Ave., Chicago.

AGENTS—Stamping names on Pocket Key Rings—sample check with your name and address, 25c. Stamping Outfits, Emblem Checks, Check Fobs, Name Plates. In advance. We deliver and collect. Outfit free. Universal Raincoat Company, 607 Broadway, New York.

AGENTS wanted to take orders for our custom-made Raincoats. Gabardines; \$75 to \$150 weekly easily earned. Commission in advance. We deliver and collect. Outfit free. Universal Raincoat Company, 607 Broadway, New York.

AGENTS—Genuine Gold Letters anyone can put on Store Window. Guaranteed not to tarnish. Large profits. Enormous demand. Free samples. Write today. Genuine Gold Letter Co., 429-A North Clark, Chicago.

AMBITIOUS Men, write today for attractive proposition, selling subscriptions to America's most popular automobile and motor magazine. Big profits. Pleasant work. Digest Pub. Co., 9505 Butler Bldg., Cincinnati, O.

SELL Wall Emblems. Every lodge member should have one. Make big money for free sample catalog plan. Key Emblem Co., Dept. PM-11, 538 S. Clark St., Chicago.

AGENTS—Clever Inventor! Inkpouch makes every pen a fountain pen. Fast office seller; big profit, demand increasing everywhere. Exclusive territory offered. Sample free. J. H. Clark Company, Tribune Bldg., New York, N. Y.

AGENTS—Men, women, to sell Pure Silk Hosiery direct to wearers. Commissions paid 10% on all commission on all repeat orders. We deliver and collect. Write Norwalk Hosiery Mills, Norwalk, Conn.

OUR Agents make \$35 to \$50 daily and are getting it with New Marvelous Invented \$1 to everybody; low price-pocket outfit. Write Suren Co., 25 N. Dearborn St., Chicago.

AGENTS—Sell Patented Cigar Lighters and Cigar Case Moistener. Write for Circulars, start making money at once. Write for Circulars, cuts and sales plan. Drake Mfg. Co., Dept. M, Milwaukee, Wis.

MAKE 600% Profit. Free Samples, Lowest priced Gold Watch for stars, for offices. Anybody can do it. Large demand. Exclusive territory. Big future. Sideline. Acme Letter Co., 2800-D, Congress, Chicago.

PORTRAIT Agents make more money. Better work, lower prices, quicker service. Also fine line of medallions, chromos, frames, etc. Catalog free. Lindner Art Company, 547-557 W. Washington St., Chicago.

AGENTS—Crew men, novelty pen, Gloo-Pen, a 50c nuclage fountain pen; everybody has it. Catalog free. Lindner Art Co., 547-557 W. Washington St., Chicago.

AGENTS make a dollar an hour. Sell Mendota, a patent patch for instantly mending holes in wet canvas, Saco mending glue. Collette Mfg. Co., Dept. 404-B, Amsterdam, N. Y.

AGENTS. \$25.00 a week for spare time. Sell \$13.45 pants \$3.45 apiece. Money-back guarantee. Guarantee Quality, Line well known. Samples free. Write Chicago Tailors Association, Dept. 106, Chicago.

\$1,000—REFOUR Christmas. You can make \$1,000. No experience necessary. Rapid selling \$4.69 household necessity, wonderful gift. You sell, we deliver, pay daily. Eastern Keenware Co., Franklinville, N. Y.

MONT Wonderful Seller, 96c profit every dollar sold; easy to carry, 96c unsolicited. Sample free. Mission, 2421-M, Smith, Detroit.

MEN'S Shirts. Easy to sell. Big demand everywhere. Make \$15.00 daily. Undersell stores. Complete line. Exclusive line patterns. Free samples. Chicago Shirt Co., 9 So. Clinton, Factory 206, Chicago.

WANTED—Representative to sell Automobiles. Killis—headlight and sun glare. Write for sample. The Clark Products Co., Springfield, Ohio.

SELL Necessities. Everybody needs and buys the "Business Guide." Bryant cleared \$800.00 in July. Send for sample free. Nichols Co., Box 4-B, Naperville, Ill.

AGENTS—Best seller: Jem Hubber Repair for tires and tubes; supercedes vulcanization at saving of over 500%; put it on cold, vulcanizes itself in two minutes and is guaranteed to last the life of the tire or tube. Sells to every auto owner and every tire dealer. For sample, \$1.00 to make big money and free sample, address Amazon Rubber Co., Amazon Bldg., Philadelphia, Pa., Dept. 105.

AGENTS—Demonstrators Making \$30 daily selling newly patented E-2-4-inches, latest, most novel Men's Neckties ever put on market. Styles take big; sell on sight. Double your money. Send \$1.00 for three trial samples. Write quick for territory. E-2-4 Manufacturing Co., Suite 1501, 20 Broadway, New York.

TAILORING Agents—We've got a wonderful line of all-wool tailors to order suits and overcoats to retail at \$29.50. They're all one price. \$20 cheaper than store prices. You keep deposits, we deliver and collect. Protected territory for hustlers. Write J. B. Simpson, Dept. 323, 831-843 W. Adams, Chicago.

AGENTS—Pull off spare time, selling guaranteed all silk white pongee shirts, direct to consumer; splendid Christmas offering. Agent's price \$2.50 with collar; make big money. Catalog free. Sample \$1.00. Pongee Shirt Co., 413 4th Ave., New York, Dept. C.

\$50,000 PICTURE Man Friedman made taking orders. Beginners can make \$100.00 weekly with no canvassing experience. Men make more. Free circular, "Profits in Portraits," explains. Samples free. Picture Man Friedman, Dept. 8, 673 Madison, Chicago.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining the overgrown National Scientific oratories, 211 North Monroe, Richmond, Va.

AGENTS: Cost \$5.00, your profit \$89.50, transferring monograms on autos, trunks, bags, furniture, etc. No experience, no license. Write for free samples. Transfer Monogram Co., Inc., 10 Orchard St., Dept. 121, Newark, N. J.

SELL the latest nationally approved cooking utensil, the Squire Broulet. Deals on sight. Consent to carry and show. \$89 profit weekly easy for live agents. Get full details from A. A. Squire Mfg. Corp., 280 Madison Ave., New York.

YOU can be your own boss with our Key Check outfit. Good for \$5 a day stamping names on pocket key checks, fobs, etc. Sample check with your name and address. 20 cents. Port Die Works, Dept. M, Winchester, N. H.

GALLAGHER made \$336.00 in one week selling guaranteed Collection Systems, used by all business men. Sayers Mfg., 2815 Sheffield Ave., Chicago, Ill.

AGENTS: Big Returns, fast office sellers; particulars and samples free. One Dip Pen Co., 2 Daily Record, Baltimore, Md.

RUMMAGE sales make \$50.00 per week. We start you. Representatives wanted everywhere. Permanent business. "Crosby Co." 699 Division St., Chicago.

We start You Without a Dollar. Soaps, Extracts, Perfumes, Toilet Goods. Experience unnecessary. Carnation Co., Dept. 20, St. Louis.

FIFTY "Ideal" Sidelines for Mail Dealers and Agents. 500% profit. K. Home, 1937 Warren, Chicago.

TOBACCO Conqueror Tablets quickly overcome tobacco habit or money back. Harmless! Inexpensive. Details free. Peerless Pharmaceutical Co., 108 Syracuse, N. Y.

FREE Sample "Rain Shield Wiper." Returns \$1.00—Costs You 25 Cents (300% Profit). Every Autolet Buys Quickly. No Patent. No Franchise. No Royalty. (1) Rub covers Windshields clear 48 Hours against Rain, Snow Storms. Invention Just Out. Prevents Accidents. (Will Save You 1/2 Hour.) Experience Unnecessary. Wonderful Pocket Sideline. Write Quick for Your Free Sample. Nulife (61) Corporation, Hartford, Conn.

AGENTS: Wonderful Sellers—Men's Diapers, Gas Mask Raincoats, "Goodyear Brand" costs you dozen lots up, \$1.85 each. Women's, \$2.00; Children's, \$1.85. Rubberized Aprons, \$3.00 a dozen, and Wonder 3 in 1 Bath \$3.25 a dozen. Order samples now. Biggest season coming. Profits unlimited. Goodyear Garment Mfg. Co., 362 East 12th St., New York, N. Y.

AGENTS: Winter is coming. Good profits selling Beacon Indian Blankets, Traveling Robes or Motor Robes, Bathrobe Blankets and Jacquard Comfortables. Beacon Blankets make warm friends. Send \$5.00 for sample, specifying which is wanted. No catalogue. Mountain State Specialty Company, Inc., 1146-1148 Water St., Wheeling, W. Va.

GOOD income, spare time, refinishing chandeliers, brass beds, automobiles, etc., by new method; producing amazing results; every household possible customer; experience unnecessary. simple plan of refurbishing at home starts you in big money-making business. Write for free samples, showing finishes, etc. Gunmetal Finish Co., Ave. H, Decatur, Ill.

GOOD Profits handling Beacon Indian Blankets. 60 x 80, \$4.00; 66 x 80, \$5.00. Samples sent post paid upon receipt of price. Mountain State Specialty Company, Inc., 1146-1148 Water St., Wheeling, W. Va.

WANTED—Men and women to sell our printed cards, social and business stationery. Special drive in Xmas cards. Big commissions. Write for terms. Printery, Dept. X, Plantsville, Conn.

\$36.00 PROFIT on \$1.50 outfit; gold initials for automobiles, etc. Address National, Station D, Brooklyn, New York.

FREE Booklet. Start little mail order home employment evenings. Write for it. Pier, Dept. 5A, 74 Cortland Street, New York, N. Y.

CHEAPEST guaranteed Seed Corn Shellor on market. Sample, 40c. Agents wanted. State Supply Company, Lima, Ohio.

AGENTS wanted to sell our line of rubber belts for men and women. Sell at slight at 25 cents each. Over 100% profit. Much more durable than leather. Particulars and sample style booklet sent free. Banner Rubber Company, Nankin, Ohio.

ADJUSTABLE Kuff Buttons are sensational sellers—automatically open and close cuffs, when sleeves are raised or lowered—great convenience. Big money maker. Flexo Mfg. Co., Sheboygan, Wis.

CALIFORNIA Rosebuds selling like hot cakes. Agents coining money; new stuff. Big profits. Catalog free. Mission, 2421-24th St., Detroit, Mich.

AGENTS control territory, Edjol Flavors, household necessities, perfumes, creams, toilet water, famous "Erding's Health Tablets." Jet Pharmaceutical Co., Allentown, Pa.

QUICK money selling "Amazing Life" illustrated, new, authentic, 25 sales daily. Outfit free. Act now. R. C. Barnum Company, Cleveland, Ohio.

HEATLESS Trouser Press, \$1.00. B. E. Israel Company, General Post Office, Box 169, New York.

AGENTS: New E. Z. Collar Buttons. Front, Back, Samples, 50c. Godwin, Sumner, Wash.

\$200 WEEKLY. Free samples. Sell gold size jewelry to stores, offices. No experience. Big future guaranteed. Can travel. Exclusive territory. Become our general agent. Acme Letter Co., 2800D Congress, Chicago.

PORTHAIT Agents—Sample Rolls, Sample Colors and Samples of all kinds furnished to the portrait trade. Write for catalog. Chicago Sample Roll Co., Dept. 1, 57 East 18th St., Chicago.

EARN big money fast applying gold initials to autos. Every owner buys—\$1.35 profit on \$1.50 sale—particulars and sample write quick. Lithograph Co., Dept. 17, East Orange, N. J.

57 MILES per gallon made with new patented gasoline Vaporizer. Write for particulars. Vaporizer Co., Pukwana, S. Dak.

WANTED, agents for food and drug specialties. Write for particulars. Mahdi Products Co., Stoneham, Mass.

AGENTS Make \$75 a week selling Hood and Radiator Covers to Ford owners only. Write today. A. & T. Sales Co., Tonawanda, N. Y.

HUSTLERS! Big Money selling Cherys Quality Brooms. 100% Profit. Write French packages. Free sample case with first order. Lee-Jackson Co., Avondale 5, Cincinnati, O.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 211 North Monroe, Richmond, Va.

AGENTS—You can make \$10 every day selling our shoes to your friends. No experience necessary. We'll show you how. Bloodworth Shoe Co., 115 S. Dearborn St., Chicago, Ill.

AGENTS—New Invention, Harper's Ten Use Brush Set and Fibre Broom. It sweeps washes and dries upstairs windows, scrubs and mops floors and does five other things. Buy it. Write for sample. Free trial. Harper Brush Works, Dept. 72, Fairfield, Iowa.

YOU can make \$10 to \$20 daily selling Rex India Fibre Brooms. Outlast three ordinary brooms. 100% Profit. Write Rex Fibre Products Company, 145-C New Jersey Ave., Brooklyn, N. Y.

MEN and Women Make Big Money from start selling exclusively Dr. Blair's famous toilet preparations for every member of the family. Complete line. Business permanent. Remarkable selling outfit. Write quick. A. B. Blair Laboratories, Lynchburg, Va.

SKILL "Amerez" Shirts; best-looking, biggest value. Manufacturer to wearer. Every order nets profit \$1.50-\$2.25. Write for winning sales plan. Menzin Shirt Co., 3863-A, Third Ave., New York.

SALES Representative wanted every county in U.S. all or spare time. No previous experience or capital necessary. Write for full particulars. A. A. Silver-Chamberlin Co., Chicago, Ill.

BIG Money and Fast Sales. Every owner buys Gold Initials for his auto. You charge \$1.50; make \$1.35. Ten orders a day easy. Write for particulars and free samples. American Monogram Co., Dept. 40, East Orange, N. J.

LIVE Agents make \$10 a day selling Eureka Strainer and Splash Preventer for every water faucet. Takes on credit. Widely advertised and known. Get details today. A. B. Seed Filter Company, 73 Franklin, New York.

MAKE \$25 to \$50 Week representing Crows' Famous Philadelphia Hosiery, direct from mill—for men, women, children. Every pair guaranteed. Prices that win. Free book "How to Start" tells the story. George Crows Company, Desk 31, Philadelphia, Pa.

AGENTS: Big Money Monogramming by Transfer Method. Catalogue Showing Over 50 Styles and Particulars Free. Motorists' Accessories Co., Mansfield, Ohio.

100% PROFIT—Free Goods—No Investment. High grade guaranteed aluminum utensils and cutlery. 10 to 15 dollars per day easily made. Perfection Aluminum Mfg. Co., Desk A, Lemon, Ill.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 211 North Monroe, Richmond, Va.

SELFOLITE—Agents, Streetmen—Selfolite Lights any fire while user sleeps, or any time. Performs surprising stunts. Newly patented. Sample 25c, postpaid; money back. Particulars, Karyiro Mfg. Co., C195 Station A, Boston, Mass.

AUTOMOBILE Free to tailoring agents. Make \$75.00 a week and up and get an automobile free taking orders for our fine tailored to measure suits. Big assortment of all Wool Fabrics all at one low price of \$29.75. Every order pays you big cash profit in advance. We supply finest selling outfit and give an automobile free to every man who qualifies. Write quick for our starting offer. Dept. 458, Park Tailoring Co., Chicago, Ill.

AGENTS—Crew Managers:—Profits—Profits—Profits. Build Permanent, Quick Repeat, Profitable Business Selling to One Polish. Best, quickest, sure-fire money-making proposition for live-wire salesmen on market. Every Housewife, Automobile Owner, Druggist, Dealer, etc., will buy. Quick repeats. Absolutely non-forging, non-dust-collecting. Harmless to finish. Exclusive rights going fast. Write for Special Offer. Daniel Abbott Co., 254 W. 54th St., New York City.

"HEAT Without Coal" New kerosene burner cooks, heats, bakes, cheaper, better, cleaner than coal or wood. Coal bills cut one-half. Fits any stove or furnace. Fuel shortage makes every home buy. Amazing big profits. Demonstrating burner Free. Selling experience unnecessary. Even Heat Generator Co., 5123 W. 25th, Cicero Station, Dept. 10, Chicago.

AGENTS—Drop your dead ones. The Universal Sanitary Milk Bottle Cover is the new home necessity. Converts bottle into pitcher. Cannot spill if tipped over. Sanitary and easily cleaned. Best 25c seller out. Sample 2c. Write now. Z. A. Art Needle Co., 513 N. Dearborn, Chicago, Ill.

SALES Agents, Men or Women: Year round position. No layoffs. Take orders for Jennings new guaranteed hosiery. Must wear and give satisfaction or replaced free. Write for outfit. Jennings Mfg. Co., Dept. 165, Dayton, O.

AGENTS: Sell full line of guaranteed hosiery for men, women and children. Must wear 12 months or replaced free. All styles, colors and finest line of silk hose. Often take orders for dozen pairs in one family; permanent customers and repeat orders make you steady income. Write for sample outfit. Thomas Mfg. Co., Class 462, Dayton, Ohio.

INSYDE Tyres Inner armor for automobiles tires. Prevent punctures and blow-outs. Double tire mileage any tire. Tremendous demand. Big profits. Sample and details free. American Accessories Co., 3-178, Cincinnati, Ohio.

RARE Opportunity. Special selling plan not offered by any other firm. Make your sales easy. Your business grows because Merit is a 100% repeater. Big pay. Exclusive territory. Write for full particulars. Merit Manufacturing Co., 1041 M. Douglas Ave., Providence, R. I.

YOU Are Lucky if we accept you as our agent. Send references. Write for proposition. Act as sole manufacturers. Houston Umbrella Company, Wilmington, Ohio.

PATENTS—Write today for free instruction book and Evidence of Conception blank. Send sketch or model for examination and opinion; state your invention. No delay in my offices; my reply special delivery. Reasonable terms. Personal attention. Clarence B. O'Brien, Registered Patent Lawyer, Southern Bldg., Washington, D. C.

TAILORING Salesmen: Make \$75.00 a week selling our strictly All-Wool Made-to-Measure Suits at \$26.50. You collect profits in advance and send us orders. No delay in Selling Outfit in America. Many exclusive money-making features. Tailoring, raincoat and side-line men, part or full time, get in touch with us immediately. Goodway, Chicago, Inc., Dept. 192, Chicago, Ill.

AGENTS, \$6 a day taking orders for Blue Ribbon Cutlery Set. Stainless steel. Guaranteed. Aluminum handle. We deliver and install. Free year-round business. Write for sample outfit. Parker Mfg. Co., 178 Awl St., Dayton, Ohio.

NO Dull Times Selling Food. The greatest, surest and safest business in the world today is selling Federal Pure Food Products, and here is your opportunity to get into this business. You can make \$3,000, \$5,000, \$10,000 or more per year—the only limit is your ability to take care of the business. We print your name and address as distributor on every package, thus making sure that you will get the thousands of dollars' worth of repeat orders which will be sent to you. No time to waste. People Must Eat, and our food products are the fastest selling, surest and quickest to repeat orders. In every home, a single sight in every home where food is used—Repeat orders immediately and every week thereafter. A Real Big Business All Your Own. Every new customer adds a great deal to your weekly income. Your business, once established, has a market value just like a store, and can be easily sold. The greatest money-making opportunity of your lifetime because you risk absolutely nothing, as we guarantee your sales, and we will not let you fail. Remember! Guaranteed! Best products, biggest sellers, sure repeat orders. No capital or experience is required. We furnish capital and everything necessary for you to become a Federal Distributor. Exclusive territory will be given honest men or women who will write at once asking us to send our "Success Guaranteed" proposition. Address, Federal Pure Food Products Company, Dept. 12, Chicago. Largest inventors of and packers of Pure Food specialties in the world. Reference, any bank, drug or Broadway railroad, Express or Railway Company in America.

SELLS Like Hot Cakes: big profits; new roofing wax pad and asbestos rest; clamps auto; perfume; clothes; outfit 10c. Vance Mfg. Co., 380 Atlantic Ave., Brooklyn, N. Y.

AGENTS: Men and women, in spare or full time, make big money selling household necessities. Every home prospers. Big profits, big profit. Territories available. Write for particulars. Judd & Leland Manufacturing Company, Box 21, Clifton Springs, N. Y.

A MAIL-ORDER business of your own, selling movie patterns, all year anywhere; free circulars. W. Wondro, 11 31 Times Plaza, Brooklyn, N. Y.

YOUR chance to make big money re-aligning mirrors, auto reflectors, metal-plating. Outfit furnished. Write for particulars. International Laboratories, Dept. 25, 309-311 E. 10th Ave., Chicago, Ill.

AGENTS: Big profits. Genuine Gold Leaf Whisker Letters anyone can put up. Scripts and 57 varieties. Chicago Agency Co., 312 Alameda, Chicago, Ill.

"HOW to Sell Patents" free. Patent News-O, Washington, D. C.

AGENTS take advantage of our heavy purchases of fiber, and sell our Victory Fiber Brooms, as corn is scarce and high. Now is the time. Paxson Mfg. Co., 119 Sanson Street, Philadelphia, Pa.

WINTER Expenses Reduced! "Econome-Cool-Sprays" saves 2/3 coal costs. 10-25-50 1.00 packages. Secure agency now. 1063 City Hall Branch, New York, N. Y.

AGENTS—make \$75 weekly selling our famous silk knitted neckties, Pennsylvania Hosiery Mills, 20 South 17th Street, Philadelphia, Pa.

MAN or Lady in every town to distribute our 7 Piece Aluminum Handled Cutlery Set. Whole or spare time. Experience not necessary. Sell on sight. Selling Guaranteed. \$10.00 per day to right people. Perfection Aluminum Mfg. Co., Desk A, Lenoit, Ill.

100% PROFIT selling, or "felt rug" by homes, hotels, offices, etc. Everybody buys. We are manufacturers, not jobbers. Prices defy competition. \$75 weekly easy. Newark Rug Company, 56-C Bergen Street, Newark, N. J.

AGENTS—make big money the year 'round selling latest New York fashions, so smart looking and low priced no woman can resist buying. Address Strump & Co., Dept. 16, 28 West 34th Street, New York City, N. Y.

"\$10 A DAY and More." our new book, shows clearly how you may gain sure success and large profits selling Guaranteed Hosiery and Underwear, factory to family. It is Free. Write today, C. & D. Company, 4 E. Grand Rapids, Mich.

"MAKE AND Sell Your Own Goods"—Tremendous Profits!—no machinery. No experience. We show you how; Write quick for Free Book. Clover Laboratories, 5501 CL North Robey, Chicago.

PORTRAIT Agents, who want good work and prompt service and who desire to purchase their frames at factory prices, should write us at once for catalog and price list. W. G. Hannan Co., Dept. A-5, 57 E. 18th St., Chicago, Ill.

OUR ExCel Luminous Crucifix shines brilliantly in the dark. Churches, hospitals and individuals are only waiting for a demonstration before buying. Agents make handsome profits. W. G. Hannan Co., Dept. B, 57 E. 18th St., Chicago.

"PORTRAIT Agents—earn big money selling our Photo Montage. Everybody buys. Charge \$5.00; make \$2.40 each sale. \$10 daily easy. Big variety designs. 4-day service. Perry Photo Novelty Corporation, Section 16, 260 Bowery, New York.

AGENTS. Get in on this nationally advertised, repeat-order proposition. In three months' time orders for Universal Product sales will come by themselves. National advertising creates the demand. All repeat orders turned over to you. Exclusive territory. Write today. Universal Victor Company, 1400 East Jefferson Ave., Detroit, Mich.

ANY man handy with paint brush or light tools can start new mechanical business, nearly trouble-free, needed everywhere, nearly profit; experience not required. John Braceland, 1457 So. Ninth, Philadelphia, Pa.

AGENTS, Opportunity Seekers, your success is obtainable if you follow our instructions. 200% profit. Send postal. Mail Order Specialty, 507 Mission St., San Francisco, Cal.

WHY work for others? Make and sell your own goods. We show you how. Enormous profits. Write quick for free book explaining everything. National Scientific Laboratories, 211 North Monroe, Richmond, Va.

MEN—Women. Make \$9 daily representing established hosiery corporation. Introduce guaranteed silk hosiery to friends and others. We deliver and collect. Details free. Empire Hosiery Corporation, 1819 Broadway, New York.

MANUFACTURE Biggest Selling Specialties without our Guaranty. Formulas. We Teach You How. Catalog Free. Allen's Enterprises, 1227 Milwaukee Ave., Chicago, Ill.

AGENTS—Big Profits. Selling Wumrub Polish, for Furniture, Woodwork, Automobiles, etc., Cleans and polishes. Write for Free Offer. Frich's Laboratories, 6431 Magnolia, Chicago, Ill.

AGENTS wanted for Silk Hosiery. Mill to wear direct. Big profits, steady business. Apply to Oxford Knitting Mills, Franklin, Tenn.

AGENTS—Big money, \$8 to \$16 a day. Aluminum handle cutlery set. Brand new. You display and take orders. We deliver and collect. Pay you 10%. Sample free. Try it. Jennings Mfg. Co., Dept. 1688, Dayton, Ohio.

AGENTS: Sell the only Collapsible, Folding, Adjustable running board Luggage Carrier, \$5.00. Write E. C. Mahoney, Huntville, Ala.

CANVASSEES—\$60 weekly. New, exceptionally useful, necessary article. Housewives, doctors, several. Address "Factory," Elizabeth, N. J.

AGENTS: Big variety Brushes. 100% profit. Producers become District Managers. Neway Brush Co., Hartford, Conn.

GET UP. Big money proposition and Free Samples on Easy applied Transfer Letters and be convinced. Auto Monogram Supply, 16 Green St., Newark, N. J.

SPIRAL, Curtain Rods, broom protectors, and sheet clips. Get clips from faster sellers. Address Hunt Mfg. Co., Box 1652-P, Paterson, N. J.

WANTED—District Purchasing Agents, \$250 per month. Steady employment and exclusive territory. Write now. Experience unnecessary. National Instrument Company, 4703 North Hamilton, Chicago, Ill.

AGENTS with Ford cars, boost your gasoline sales and your income by selling the hill-climber known. Cyclo Manifold Co., South High, Akron, Ohio.

MAKE Money at Home making Toys and Novelties. Free Catalog. Write Specialty Co., 158 E. 31st St., New York.

DISTRIBUTOR Agents: Beauty Clay is making millions. Advertised everywhere. 500% profit. Beau-T-Pak Co., 506 Lyon St., Grand Rapids, Mich.

AGENTS—Big profits. Gold Sign letters easily applied, samples free. Liberal offer to General Agents. Dept. C, Interstate Sign, 2620 No. Halsted St., Chicago.

FREE—Formula Catalog. S. & H. Laboratory, 1015 Madison Building, Chicago.

AGENTS—Quick. New. What is it? Hundreds answered this advertisement last month; now making two dollars hourly up-wards; 35c profit every 35c sale; think of it; sell on sight, repeat sale free. Address Empire Branch, 7201 Atlantic Ventnor, Atlantic City, N. J.

WHY waste time on experiments? Needle Book and Needle Supply. Write for best, flashiest and cheapest Needle Books on the market. Retail from 10c to a dollar. English make. Send for sample and illustrated catalogue. Lea Brothers, 145 East 23rd St., New York.

AGENTS, mail-order men, beginners. Something new, valuable, inside information. Write. Nite Mail Order & Supply Co., 609 27th St., Denver, Colo.

LIVE Men wanted to handle popular fast-selling electrical handbooks; sells at \$1.00. Sample carried in pocket. Can make \$10.00 a night. Write for details. Address, Burgess, 749 E. 42nd Street, Chicago.

EARN \$10.00 daily silvering mirrors, plating and refinishing metalware, autos, chandeliers, bedsteads, headlamps. Outfits furnished. Decle & Broderick, 1183 Broadway, New York.

AGENTS, canvassers, crew managers. Sell needle books, quick sales, large profits. Particulars upon request. Johnson Bros., H5319 Princeton Ave., Chicago, Ill.

THE Agents' and Salesmen's Guide, tells where to buy almost everything. The most wonderful list of business opportunities ever published. Copy. Wilson Publishing Co., 1400 Broadway, New York.

AGENTS—Steady Income. Large manufacturer of Handkerchiefs and Dress Goods, etc., wishes representative in each locality. Factory to consumer. Big profits, honest goods. Whole or spare time. Credit given. Send for particulars. Address "Freeport Mfg. Co., 55 Main St., Brooklyn, N. Y."

\$75.00 A WEEK. "Whirlwind sellers." Free samples. (10 new specialties.) Dollars roll into Agents. "Surprises" "em all." Every home, office, automobilist, garage,ecessory store needs 1 or 2. No money. No experience necessary. You get all "re-orders." Factory (A), Box 494, Harrison, Conn.

GOLD Leaf Sign Letters: make and sell; profits exceed 1,000%; immense demand; particulars free. Johnston Co., Quincy, Ill.

BIG daily commissions selling printing. Particulars free. "Adverpress," Station C-3, Milwaukee.

PORTRAIT Agents: Our goods will make you big profits. Delivery guaranteed. Rejected credited. Prompt shipments. Send for latest catalog and prices. Adam J. Kroll & Co., 602 Blue Island Ave., Chicago, Ill.

USEFUL and attractive Xmas gift. 100% profit. Catact Auto Washer Co., Dept. P, Topka, Kansas.

HIGH-GRADE SALESMEN WANTED

WERE you ever offered a grocery store? You can handle Sugar, Flour, Canned Goods, Dried Fruit, Coffee and entire line of groceries, as well as Paints, Roofing, Aluminum Ware and Automobile Oils, with no money down, no experience. Take large orders from samples. Goods are guaranteed and proven quality. Selling experience not necessary. Steady, profitable work for "Cash." Address: Adair-Hatchell Co., Dept. 200, Chicago, Ill. Reference: Any Bank or Express Co.

MINUTES pay dollars demonstrating world's greatest specialty. Wonderful new three-pound Adding Machine. Retail \$15. Work equals \$300.00 machine. Adds, subtracts, multiplies, divides, automatically. Speedy, accurate, reliable. Write for 1-year Guarantee. Tremendous demand everywhere. Amazing profits, main or side-line. Drive your income home. Write quick for liberal trial offer and protected territory. Lightning Calculator Co., Dept. G, Grand Rapids, Mich.

SALESMEN, Solicitors, Territory Men—at least \$1000. Fire Extinguisher deadly to all fires, which will not get out of order, freeze, or deteriorate selling at \$1.00 and \$1.50. Free trial facts to home, office and garage. Attractive proposition to live hustling men. Write Red Cup Lubricator Co., 1603 S. Michigan Ave., Chicago.

EASY to sell Groceries, Paints, Automobiles, Oil, Roofing, Stock Food, to consumers from samples, no capital or experience necessary; steady, profitable work. Commissions advanced. Satisfaction guaranteed. 50 years in business. Write for full particulars. **Lorain & Browne Co.**, Wholesale Grocers, 1775 S. State Street, Chicago, Ill.

SALESMEN Wanted—Local or traveling, part or full time, to sell calendars, fans, fly swatters, brushes, rulers, etc. Over two hundred stock dealers, wire of full particulars, etc., for all merchants. Fine side line, liberal commission. **The Harrison Co.**, Union City, Ind.

SALESMEN—Become Independent. Own your business; experience unnecessary; selling our \$7,500 Accidentals, \$500 Accident, \$250 Weekly Benefits; \$12.50 yearly; other amounts proportionate. Guaranteed steady income from renewals. \$250,000 deposited Insurance Department. Registration Dept. A, Newark, N. J.

MAKE \$5,000 every year—\$2,000 in spare time. You share profits besides. Show "Weather Monarch" Raincoats and Waterproof Overcoats. Ask about "Duol Coat" (No. 1000). Get same size raincoat free. Associated Raincoat Agency, Inc. 446-A North Wells, Chicago.

SALESMEN Can make \$5.00 a day selling our Calendars, Pencils, Signs, Advertising Novelties, Traveling, Whistles, etc. Liberal terms. Sell year. Fine side line. Local and traveling agencies. Model Calendar Co., Dept. 226, South Bend, Ind.

AMBITIOUS Men, write today for attractive proposition, selling subscriptions to America's most popular Automobile and sportsman's magazine. Quick Sales. Big profit. Pleasant work. Digest Pub. Co., 5905 Butler Bldg., Cincinnati, O.

AGENTS—\$400-\$200 a week. Free samples. Gold sign letters anyone can put on store windows. Liberal offer to general agents. Metallic Letter Co., 431-E N. Clark St., Chicago.

OIL Burners—Climax for residence furnaces and stoves, described in interesting brochure, "The Burning Question," sent free. Address, E. L. Miller Mfg. Co., 2230 W. 3rd St., Kansas City, Mo.

SELL something original! Something every merchant needs—"Zim's Peerless Collection System." Exclusive collecting features has collected for 1% cost. Sells "Zim's Creditors' Association." E-512 McKnight Bldg., Minneapolis, Minn.

SALESMEN, Act Quick. Ten patented auto necessities. Spark plugs, visors, windshield cleaners, hose clamps, etc. Generous commissions. Jubilee Mfg. Co., 82 Sta. C, Omaha, Neb.

SOMETHING New, a necessity. All business and professional men need it. Sells \$7.50, cost you \$1.40. Big repeater. Write for sample. Merchants Assn., Minneapolis, Minn.

TWO Oklahoma side line salesmen are active daily—sell the Rose Special Fountain Pen, selling to dealers. Try it. D. N. Rose Co., Tulsa, Okla.

SALESMEN make good side money selling small acetylene torch to garages and shops. Easy to sell. St. Paul Welding & Mfg. Co., St. Paul, Minn.

MOST Wonderful Sell. 96¢ profit every dollar. No stock to carry. License unnecessary. Sample free, Mission, 2421-MP, Smith, Detroit.

TERRITORIAL Salesmen with car. Commission. R. B. Carroll, Saugetuck, Mich.

\$125 To \$300 a week. Salesmen with slight knowledge of motors who can reach city centers, order for full particulars, making a single sale. If they can also make sales, profits may reach \$25,000 yearly. Phillips, 225 W. 25th St., New York.

\$4.00 PROFIT on every \$5.00 sale. "Free Sample"—new specialty. (Money Getter). Every Storekeeper, Dealer, and Cashier. Connors made \$30.00 First Hour. Dacey made \$86.00 First Day. Experience unnecessary. All territories now open. Drawer 555 Hartford, Conn.

SALESMEN: The Kendall Envelope Salesmen appear to every user of the mails because it sells 60 a minute. Sells \$3.00. No competition. Exclusive territory. Consolidated Co., 1002B Boylston St., Boston, Mass.

SALESMEN, Agents, 150% profit selling our Radiolite and Standard Show Cards. Every merchant buys. Nelson, 353 No. State, Chicago, Ill.

RADIOLITE—Wonderful discovery starts world. Charges batteries in 10 minutes. Sell free to agents. Radiolite Company, St. Paul, Minn.

MAKE \$150 weekly. Go-getter salesmen, demonstrate, sell practical, sensible rim tool tire changer. Retailers guarantee \$15. Big demand. Liberal commission. Write, Service Mfg. Co., Inc., Elkhardt, Ind.

SUBSTANTIAL corporation manufacturing several articles under valuable patents, can place several more general sales managers, open branch offices, manage salesmen, \$500 to \$2,000 necessary to finance agency; expenses allowed. Write Chicago. If you qualify, Mr. Inman, 9 South Clinton Street, Chicago, Ill.

CLOTHING Salesmen Wanted at once to sell High Grade Virgin Wool Custom Tailored suits and overcoats direct to retail at \$28.00. Satisfaction guaranteed, big commissions; experience not necessary; exclusive territory to men who qualify. House of Callon Inc., 146 S. State, Chicago, Ill.

BEST Sell: Jem Rubber Repair for tires and tubes; supercedes vulcanization at saving of over 80%; put it on cold, vulcanizes itself in two minutes, guaranteed last life of tire or tube; sell to every auto owner and accessory dealer. Get particulars how to make big money and free sample. Amazon Rubber Co., Philadelphia, Pa., Dept. 510.

SALESMAN—Household necessity. Sells readily. Coal situation creates tremendous demand. Our liberal discount permits handsome profit. Strong advertising help furnished. Write for price list or write for distributor proposition. Crown, Richmond, Ind.

TAILORING Salesmen: You can earn \$50.00 to \$100.00 a week selling our virgin wool line of tailored to order suits and overcoats retailing at \$29.50. None higher. All one price. Regular \$50.00 values. We have a large assortment of rich dependable fabrics, beautiful patterns and weavers. Satisfaction guaranteed. You collect your profits in advance. We ship C. O. D. to you. No advance money investment required. We furnish 6x9 switch line complete with agency supplies. Protected territory for hustlers. Substantial income derived from business after first season. Experience not essential. Write before your territory has been spoken for. Address, J. B. Brown, Dept. 325, 831 W. Adams Street, Chicago, Ill.

LOCAL Representative for Million Dollar Business—One man to take charge in each county of old established line, seventy-five different products, all new. "Selling" five-point plan based on a free gift. Remarkable chance for advancement if you are honest and will work. Send full particulars of yourself and record. Sales Mgr., 1400 W. 37th St., Chicago, Ill.

SALESMEN: We want 500 men to sell Reversible raincoats direct to consumer. One nice stylish Fall topcoat, other side storm-proof raincoat, coats for price of one. Show coat and sale is made. No experience or capital required. We deliver \$100.00 to \$300.00 to \$400.00 monthly. \$10 daily easy for spare time. No waiting for your pay. Paid daily. Biggest money-making proposition ever offered an agent. Sample free. Write for free literature. Our selling plan is a winner. Be first in your territory. Write quick, Mac-O-Chee Mills Co., 1000 E. 12th St., Minneapolis, Minn.

AGGRESSIVE District Managers and Salesmen are lining up with this most unique sales plan. It makes you your own manager and provides you with yearly earnings of \$25,000. For a limited time, where you set your own limit. It's film advertising service, screening in local theaters. Drop a postcard for an interesting story too long to tell here. Territory rapidly filling. Address Alexander Filmery Co., 1151 Main Avenue, Spokane, Wash.

HELP WANTED

WHAT is it worth to you? Distributor, District Manager, Salesman or Agent, to carry the agency for the Rubber Specialties on the market. Hot-Water Bottles, Bathing Caps, Combination Shopping Bags, Pure Rubber and Rubber-lined Rubber Clothing, and forty other fast-selling articles needed in every home. Profits range from 100 to 150 per cent. Write for full particulars. B. G. Rubber Co., 618 Penn Ave., Pittsburgh, Pa., Dept. 206.

SALESMEN. Independence awaits the Live Wire who grasps this opportunity. Warehouses, terminals, steamship companies, factories, hotels, cafes, etc., desperately need our scientific, positive, but simple method of extermination of rats and mice; grateful clients and long contracts await you; best exclusive territories going fast. Commission only. Write to-day. **Raisin Laboratory, Inc.**, 115 Broad St., New York.

\$5 To \$15 Daily Easy—Introducing New Style Guaranteed Hosiery. Must wear or replaced free. No capital or experience required. Guaranteed samples. Write today. Your pay in advance. We deliver and collect. Elegant outfit furnished all colors and grades, including silks—wool and headwear. **The Mac-O-Chee Mills Co.**, Desk 10512, Cincinnati, O.

UNITED States Government Wants Men. Excellent positions at attractive salaries. Railway Mail Clerk Examination soon. Let our expert, former United States Civil Service Examiner, prepare you for this and other fine positions. Write today for free catalog P.M. Patterson Civil Service School, Rochester, N. Y.

DISTRICT Managers: Big profits. Men capable of organizing and managing crews of lady solicitors can easily clear \$50 to \$100 per week with the B. & G. Protector, the original and highest protector on the market. Every woman between fifteen and fifty needs and buys it. B. & G. Rubber Co., 618 Penn Ave., Pittsburgh, Pa., Dept. 205.

150,000 SALES of a \$12.50 household appliance in New England have paid salesmen \$25 to \$150 weekly. We want District Managers for exclusive territory throughout the U.S. to sell direct or obtain sub-agents. **The Beeves Company**, 66 Broad Street, Milford, Conn.

INVENTORS desiring to secure patents should write for our book, "How to Get Your Patent," tells our terms and methods. Send sketch for our opinion of its patentable nature. **Randolph & Co.**, Patent Attorneys, 820 F. Washington, D. C.

BE a Railway Traffic Inspector! \$110 to \$250 monthly salary, 100 days pay for 3 months spare-time study. Splendid opportunities. Position guaranteed or money refunded. Write for free booklet CM-46. **Stand. Business Training School**, 1000 N. 1st St., St. Paul, Minn.

PORTRAITS. Photo pillow-top, frames, sheet pictures, medallions, merchants' signs, waterproof and tea aprons, silk and wool hose, luminous crucifixes. Catalog free; 30 days credit. **Jas. C. Bailey Co.**, Desk J-12, Chicago.

SIGN Letter Agents and Painters; 500% Profit. Gold and Silver Sign Letters for Stores and Office Windows. Anyone can put on. Big demand. Free samples. Metallic Letter Co., 431D N. Clark St., Chicago.

AMBITIOUS Men, write today for attractive proposition, selling subscriptions to America's most popular Automobile and sportsman's magazine. Quick Sales. Big profit. Pleasant work. Digest Pub. Co., 5905 Butler Bldg., Cincinnati, O.

DISTRICT Managers, general agents, with ability to organize force of producers wanted. Old established firm. Big-paying proposition. Write for details to Fitzhugh Dry Goods Company, 915 Fitzhugh Building, Trenton, N. J.

START a pressing, cleaning and dyeing shop; excellent field, splendid profits. We tell you how. Write for literature. **Conyde Systems**, Dept. C, Charlotte, N. C.

MEN Wanted to take up Finger Print Work. Experience unnecessary. Write for particulars explaining guaranteed position. Universal Finger Print System, Dept. FG, St. Louis, Mo.

ALL men, women, boys, girls, 17 to 60, willing to accept Government Positions, \$117-\$190, traveling or stationary. Write to-day. **131 S. St. Louis, Missouri.**

OUR genuine gold window sign letters are an excellent money-making proposition for handy men. **Slann Sign System**, Bethune Ave. E., Detroit, Mich.

STORIES, poems, plays, etc., are wanted for publication. Good ideas bring big money. Submit manuscripts or write Literary Bureau, 522, Hannibal, Mo.

WANTED: Railway Mail Clerks—\$1,800 to \$2,300. Everywhere. Write today for full information. **Patterson, Civil Service Expert**, Box 4025, Rochester, N. Y.

WRITE Articles, stories, news, in spare time for newspapers and magazines. Big pay. Copy right free. Press Syndicate, 553, St. Louis, Mo.

BOYS—Men. Become Automobile Experts. \$35 week. Learn while earning. Write Franklin Institute, Dept. K-101, Rochester, N. Y.

MAKE money writing Photo-plays; details free to beginners. No correspondence course. Producers' League, 230 Walnwright, St. Louis.

BE a Finger Print Expert—Opportunities opening everywhere. Write National System, 186 East 79th, New York.

MEN wanted to qualify for Firemen, Brakemen, Transients furnished. Write W. Boggers, St. Louis.

SILVERING Mirrors, French plate. Easily learned, immense profits. Plans free. Wear Mirror Works, Dept. 25, Excelsior Springs, Mo.

HOME work in spare time. Full particulars 10 cents. Helms Company, Hoboken, N. J.

U. S. GOVERNMENT positions. Men—women over 17. \$100 to \$185 month. Steady work. No strikes. No lay-offs. Life position. Quick steady raise. Vacation with pay. Either inside or outside work. Common education sufficient. Experience unnecessary. Pull unnecessary. Full information and list positions free. Write Franklin Institute, Dept. L3, Rochester, N. Y.

DISTRIBUTION managers wanted for nationally advertised Beauty Club to finance and hire agents. Beau-T-Pak Co., 506 Leon St., Grand Rapids, Mich.

EARN \$10 daily silversmithing, plating and refinishing metalware, autos, chandeliers, bedsteads, headlights. Outfits furnished. E. Decle Laboratories, 1133 Broadway, New York.

MEN over 17. Become Railway Mail Clerks. Commence \$133 month. Steady. Common education sufficient. List positions free. Write immediately Franklin Institute, Dept. L21, Rochester, N. Y.

FREE Booklet. Start little mail order business. Home employment evenings. Write Dept. 4A, 74 Corland Street, New York, N. Y.

MEN—Boys over 17. Become Railway Mail Clerks. \$135 month. List positions free. Franklin Institute, Dept. L21, Rochester, N. Y.

BOYS, Girls, Men, \$8.00 daily. Christmas, Easter Post-card Packages. 10c for Samples. Dealers Supplied. Wells, 912 Magee, Philadelphia, Pa.

OPERATIVES Wanted everywhere for National Information Bureau; male and female. A. B. Fox, Secretary, Brazil, N. D.

RAILWAY Mail Clerks wanted. \$135 month. List positions free. Write Franklin Institute, Dept. L21, Rochester, N. Y.

FREE Plans. Stop Daily Grind. Silver mirrors, headlights, tableware, etc. Clarence Sprinkle, Dept. 28, Marion, Ind.

WANTED—men—women over 17. Many government jobs obtainable. Steady. \$100-\$195 month. List free. Franklin Institute, Dept. L21, Rochester, N. Y.

WANTED men to learn Motion Picture Operating. Good pay; steady work; jobs secured for competent men. Address today! Operator, Box 38, Sioux Falls, S. D.

\$35 WEEK. Boys—men. Become automobile experts. Learn while earning. Write Franklin Institute, Dept. L-401, Rochester, N. Y.

EARN \$15-\$50 weekly writing show cards. No canvassing. Experience unnecessary. We train you. Particulars, terms free. Shoreline Sign System, Inc., 1908, Detroit, Mich.

RAILWAY Mail Clerks, Postoffice and other help wanted by Government. \$1400 to \$2300. Examinations everywhere soon. Write today for full information. Chicago Civil Service College, A-41 Keener Building, Chicago.

BE a Finger Print Expert. Demand increasing. Write for special free offer. American Finger Print System, 1966 Broadway, N. Y.

FIREMEN, Brakemen, Baggagemen, Sleeping car train porters (colored). \$140-\$200. Experience unnecessary. 810 Railway Bureau, East St. Louis, Ill.

LOCOMOTIVE Firemen, beginners, \$150, later \$250 monthly, for railroad nearest their homes, everywhere in United States and Canada. Address Railway Association, Desk M-1, Brooklyn, N. Y.

GOVERNMENT jobs. Men—women. Good pay. Write for information. Secretary, Box 1715-F, Washington, D. C.

SITUATIONS WANTED

AS manager of telephone exchange, 1500 subscribers or less. 16 years experience. Address Box 83, Hillsboro, Wis.

TWO energetic Young Engineers, sound commercial training. Desirous represent one or two American Firms possessing specialties. Box 2100, Popular Mechanics Magazine, Chicago.

FOR ADVERTISERS

ADVERTISE in 24 Big Sunday Newspapers. 25 words \$15.00. Catalog listing 1100 leading Dailies, Weeklies, Magazines, 4c stamps. Union Advertising, Baltimore Bldg., Chicago.

ITEMIZED latest advertising rates every large daily, complete, 10c. Kilne, Kilne Bldg., Kent, Ohio.

INCH Display Advertisement 161 Magazines Thrice \$15 Year \$50. Page \$100. Wood's Popular Services, Atlantic City, N. J.

BLOTTERS will advertise your business or product. Samples for stamp. Labarso Company, Pittsford, Pa.

ADVERTISE Your ad in 100 magazines for 1c per word. Sample copy 10c. Harley Snell, 1021 State Ave., Cincinnati, Ohio.

COMMERCIAL Engraving and Printing—the most practical and complete book on engraving, printing and allied subjects ever published. Over 800 pages. Over 1500 illustrations presenting over 3500 distinct ideas on 35 separate subjects. Cloth, Price \$15.00. Popular Mechanics Book Dept., 6 N. Michigan Ave., Chicago.

INTERNATIONAL—Opportunity: a live, inspiring, intensely interesting magazine! Six months, 25c. International circulation! Add 1c word. 2279 First Ave., New York.

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RELIABLE information furnished on any subject or money refunded, 75c. Co-operative Service, Times Plaza, Box D64, Brooklyn, N. Y.

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INCORPORATE. Our lawyers do the work, saving you time, annoyance and money in incorporating under the most liberal laws of Arizona. Laws and forms free. Southwestern Securities & Investment Co., Box D488, Phoenix, Ariz.

PURCHASES made, business commissions reliably executed in New York City and vicinity for non-resident firms, families or individuals. Edward Boyle, 309 Fifth Ave., New York.

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ADVERTISERS get our lists. Jacobus Advertising Service, Irvington, N. J.

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TYPEWRITERS. All Makes. Save one-half. Thoroughly Rebuilt in our factory by the famous "Young Process." Fully guaranteed. Free trial. We handle all standard makes. Cash or sold on easy terms. Write for Catalog. Young Typewriter Co., Dept. 415, Chicago, Ill.

UNDERWOOD Typewriters at far less than manufacturers' price; rebuilt, all worn parts replaced, guaranteed good as new. Cash, installment payments. Write for Catalog 1519. Shipman-Ward Mfg. Co., estab. 1891, Montrose and Ravenswood Ave., Chicago, Ill.

ALL makes rebuilt, refinished and guaranteed five years; thirty days' free trial allowed. Oliver, Underwoods, Monarchs, Remingtons; others \$15.00. Send for our lists and agents' proposition. Typewriter Exchange, 2316 University Ave., New York City, N. Y.

TYPEWRITERS, all standard makes, \$10 up to \$150 guaranteed. Free trial. Write for Illustrated Bargain List. Northwestern Typewriter Exchange, 320 West Goethe St., Chicago.

DUPLICATORS AND DEVICES

"MODERN" Duplicators save Time, Labor, and Money. Getts Bureau. Reproduces Typewritten, or Penned Letters, Drawings, Lessons, Music, Menus, Hids, Notices, Specifications, Maps or anything in one or more colors. Prints Two per minute. Special Sale On 30 Days Free Trial. \$2.25 up. Booklet Free. J. E. Durkin, 1005 E. Pittsburgh, Pa.

YOU can make \$5 to 10 cents of a letter, notice, etc., at a cost of three cents on a Hoyer Quality Duplicator. Write for free trial offer. The Hoyer Duplicator Co., 122 No. Wells St., Chicago, Ill.

ADDING MACHINES

FREE Trial. Marvellous new Adding Machine. Adds, Subtracts, Multiplies, Divides, automatically. Work equals \$350.00 machine. Price only \$15.00. Speedy, durable, handsome. Five-year guarantee. Used by largest corporations. Write today for catalog and free trial offer. Lightning Calculator Co., Dept. E, Grand Rapids, Mich.

NEW \$3.50 Automatic Adding Machine. Adds, Subtracts, Multiplies. Absolutely accurate. Capacity 999,999.99. Fully guaranteed. 75,000 pleased users. Makes adding easy, positive, quick. Eliminates Mistakes. Saves Time. Postpaid. \$3.50. Set Co., 1458-K, Hollywood Ave., Chicago.

PRINTING, ENGRAVING AND MULTIGRAPHING

12 CHRISTMAS Cards. Steel Engraved design—appropriate for anyone—with greeting and name Process Engraved in Old English or script. Postpaid. \$1.25. Send check or Money Order. Universal Process Engraving Co., 262 So. State Street, Chicago.

REDUCED prices for better printing. 1,000 Bond letter-heads, \$5.00; 1,000 good envelopes, \$1.25; 1,000 four-page folders, 3 1/2 x 4 1/2 inches, \$12.00. Catalogues, circulars, booklets our specialty. All printing at reduced prices. Samples free. Fantus, 525 S. Dearborn St., Chicago.

GOLD lettered advertising-pencils for you; buy direct, save entire middleman's profit. Samples free (no agents). Address, S. Musial & Co., 422 Walnut St., Yorkers, N. Y.

TRY our attractive two-color letterheads on 20 lb. watermarked bond, 2,000, \$9.50; 5,000, \$19.50. E. Fowler, Clintonville, Conn.

250 LETTERHEADS, 250 white envelopes printed and mailed, \$3.00. Samples printing free. Sunco, Mohawk, N. Y.

100 NEATLY printed name cards with beautiful card case. 50c (coin). Gem Card Co., Marion, Ind.

BETTER Printing prepaid for today. Money. Samples for stamp. Write to us. Model Company, Manchester, Iowa.

500 GUMMED Stickers 25c. Printed with Name and Address. LeBeuf, Fairview Station, Detroit, Mich.

A CHRISTMAS Gift: Monogrammed Stationery, extra good linen. 8 sheets, 48 envelopes, \$1.00. Your choice, Blue, Buff, Gray, Lavender, Pink, Khaki or White. Schiller & Armstrong, West Boylston St., Worcester, Mass.

1,000 20-lb. BOND Letterheads, \$3.50; 5,000, \$15.00. Samples, Annville Printing Company, Annville, Pa.

IMITATION Typewritten Letters, Multigraphing, Mimeographing, Printing. Cal System, Fairview Station, Detroit.

PRE-USED Printing Presses, Type and supplies. Used for stamp. Popular Bargains, Richmond, Va.

PRINTING Outfits—Presses, type supplies, type novelties. Send stamp for catalogue. Model Press, York, Penna.

1,000 HAMMERMILL Letterheads or Envelopes, \$4.00. Full Line Samples Free. Quality Printshop, Marietta, Ohio.

1,000 LETTERHEADS or Envelopes, \$3.00. Sent Prepaid. Samples Free. Monitor Press, Morrisville, Pa.

PLATE Press, Engraved and Embossed Stationery. Samples Free. Send \$1.00. 363 Jay Street, Brooklyn, N. Y.

1,000 BOND Letterheads or Envelopes, \$3.25 prepaid. Englewood Press, Toledo, Ohio.

WE Print Envelopes, Letterheads, Folders, etc. Reasonable. Address Jofor Bureau, Longbranch, N. J.

100 BUSINESS Cards, 40c; name and address on a Rubber Stamp, one stamp paid, postpaid, 50c. Wm. Sirdevan, Coates Bldg., Havana, O.

500 WATERMARKED Letterheads, Cards or Envelopes, \$2.75; 1,000, \$3.75. Eies Printing, 255 W. 30th St., New York.

225 BOND letterheads, envelopes, bill-heads, cards, \$1.25 each. Combination, \$4.00. Economic Press, Leontia, N. J.

250 EACL 20-lb. Hammermill Letterheads and Envelopes, \$2.75. Drevton Press, Detroit, Minn.

EMBOSSED business, personal stationery. Samples, stamp. Daniels Company, Pittsboro, Pa.

250 HAMMERMILL letterheads, envelopes, \$1.25; 1,000, \$3.00. Troib, 98 Providence, Worcester, Mass.

WE print anything. Circulars, stationery, Catalogs. Samples. Commercial Press, Batavia, Ohio.

5000 5/8 x 3/4 CIRCULARS, \$8.50; 5/8 x 6/8, \$6.50; 3/4 x 5/8 Slips, \$5.00. Special price 10,000-25,000. Barrain List, Samples Free. Good's Printery, Harrisonburg, Va.

BOOKLET, catalogue and commercial printing, reasonable prices. Printery, Bremen, Ohio.

1000 HAMMERMILL bond letter-heads or envelopes, \$3.45. Multigraphing at low prices. Samples on request. Address C. B. Hatfield, Box 353, Owego, N. Y.

FOR SMOKERS

HOMESPUN Smoking Tobacco, mild and mellow—10 lbs., \$1.50; 20 lbs., \$2.75; delivery guaranteed. We furnish free recipe for preparing. Smoking Tobacco Exchange, Sedalia, Ky.

SMOKE Real tobacco. Sample 10c. Folder free. Direct to smoker, Hast Mailing Co., Paduch, Ky.

MADE IN Germany. "Columbia." New patent shagpipe. Smokes perfectly dry. No waste of tobacco. Biggest nicotine absorber. Easy cleaned. 75 cents postpaid. (Send for Money Order.) Dealers special price. Ben Gamms, Importer, 673 North Dearborn Street, Chicago, Ill.

FOR MEN

ARE You Old at Forty? See our advertisement on page 14 of this issue. The Electro Thermal Company, Steubenville, Ohio.

RAZORS AND BLADES

"BLADEKNIFE" utilizes your own discarded blades. Reliable. Useful tool; elegant pocket novelty; household necessity. Sample 25c. Martin Bladeknife Co., Paterson, N. J.

BLADES, resharpened, one edge 2c; double edge 3c. New York Edge Co., Glen Cove, N. Y.

BLADES Resharpened, 3c. Any make. Guaranteed Service. Standard Safety Razor Corporation, Pittsburgh, Pa.

BOATS AND LAUNCHES

"HOW to make your boat leakproof." 16-page booklet. L. W. Fernald & Co., 152 Cleveland St., Boston, Mass.

16' ROWBOAT—Easily made. Construction blueprint, 30c. Wescho-Uco, West Market, Detroit, Mich.

ANTIQUES AND WAR RELICS

FOR Dens, Relics collected from Europe's battlefields. Completely illustrated catalogue and Sample War Photographs, 25c. I also buy War Relics, Lieut. Welsh, 217 Regent Place, Brooklyn, N. Y.

SEND 5c for may best list, coins, Indian relics, antique firearms. F. E. Ellis, Webster, Groves, Mo.

PHONOGRAPHS AND RECORDS

BUILD Your Phonograph. Quality phonographs. Famous Serebato Motors. Also original Perfection Motors. Electric Motors, tone arms, reproducing amplifiers, case material, accessories. Free blueprints and building instructions. Big saving. Wonderful results. Prompt delivery. Catalog mailed for ten cents. Howler Manufacturing & Supply Co., 313 Baldwin Block, Indianapolis, Ind.

BUILD a genuine Choralion phonograph and save over half. Big profit building and selling. We furnish motors, tone arms, full instructions and all necessary parts. Send for catalog and free blueprint offer. Choralion Phonograph and Radio Co., 1222 11th St., Elkhart, Ind.

BUILD Your Own Phonograph. Big saving. Pleasant, instructive work. Complete instructions, blue-prints, etc., absolutely free. Write today. Associated Phonograph Co., Dept. AP-10, Cincinnati, Ohio.

UNASSEMBLED Phonograph Cabinets, Motors and Tonearms at wholesale. Free catalogue. Dauser, 434 W. 12th Place, Chicago.

PERFECTION Phonographs, motors, tonearms, amplifiers, cabinets, hardware. Radio specialties. Highest quality, low price. Catalog free. Federal Supply Co., Indianapolis, Ind.

PHONOGRAPH Builders for guaranteed equipment assuring finest results and Best Values. Write Superior Phonographs Co., Erie, Pa.

BUILD your own Phonograph. Our motors, tone arms, are best and lower priced. Write for catalog today. American Phonograph Co., 3513 North Crawford, Chicago.

SPECIAL values, until sold. High grade machine and 25 records, \$25. Seeber & Hornein, Buffalo, New York.

MUSIC AND MUSICAL INSTRUMENTS

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Continued from Page 48

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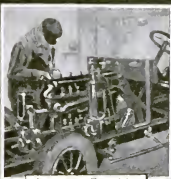
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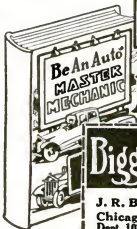
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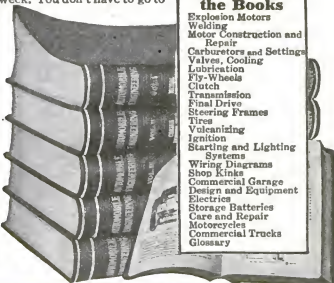
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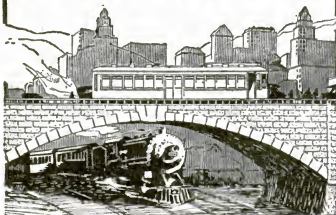
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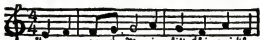
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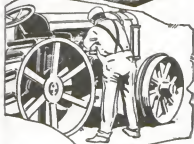
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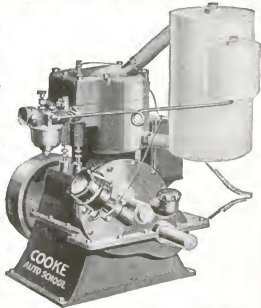
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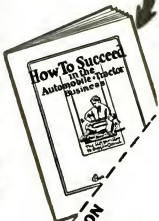
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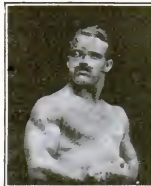


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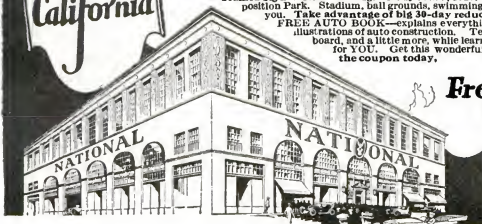
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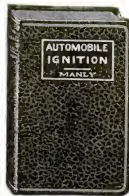
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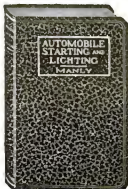
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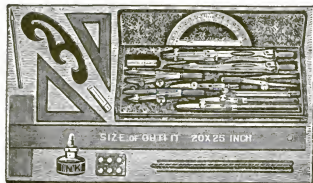
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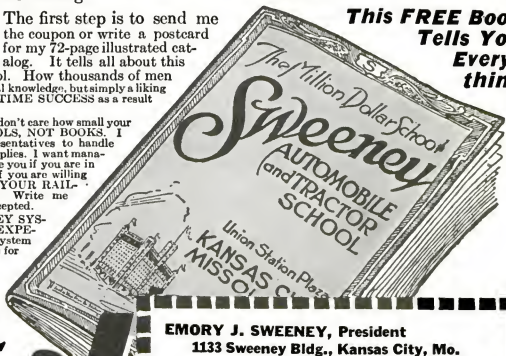
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Without cost or obligation on my part, please tell me how I can qualify for the position or in the subject before which I have marked an X:

BUSINESS TRAINING DEPARTMENT

- | | |
|---|---|
| ☐ Business Management | ☐ Salesmanship |
| ☐ Industrial Management | ☐ Advertising |
| ☐ Personnel Organization | ☐ Better Letters |
| ☐ Traffic Management | ☐ Foreign Trade |
| ☐ Business Law | ☐ Stenography and Typing |
| ☐ Banking and Banking Law | ☐ Business English |
| ☐ Accountancy (Inc. C.P.A.) | ☐ Civil Service |
| ☐ Nicholson Cost Accounting | ☐ Railway Mail Clerk |
| ☐ Bookkeeping | ☐ Common School Subjects |
| ☐ Private Secretary | ☐ High School Subjects |
| ☐ Business Spanish ☐ French | ☐ Illustrating |

TECHNICAL AND INDUSTRIAL DEPARTMENT

- | | |
|--|--|
| ☐ Electrical Engineering | ☐ Architect |
| ☐ Electric Lighting | ☐ Blue Print Reading |
| ☐ Mechanical Engineer | ☐ Contractor and Builder |
| ☐ Mechanical Draftsman | ☐ Architectural Draftsman |
| ☐ Machine Shop Practice | ☐ Concrete Builder |
| ☐ Railroad Positions | ☐ Structural Engineer |
| ☐ Gas Engine Operating | ☐ Chemistry ☐ Pharmacy |
| ☐ Civil Engineer | ☐ Automobile Work |
| ☐ Surveying and Mapping | ☐ Airplane Engines |
| ☐ Metallurgy ☐ Radio | ☐ Agriculture and Poultry |
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Name.....

Street Address.....

City..... State.....

Occupation.....

Persons residing in Canada should send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada.

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You have seen it in the magazines for years—this world-famous coupon of the International Correspondence Schools.

It is just a little thing in size, but mighty in possibilities. For it has been the means of bringing advancement and more money to thousands upon thousands of men in all circumstances and in every part of the world.

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INTERNATIONAL CORRESPONDENCE SCHOOLS

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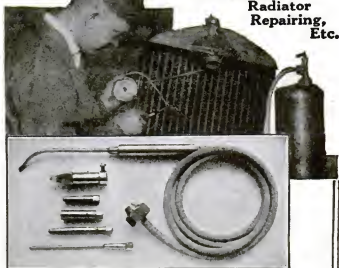
Write department "M" enclosing money order if your dealer cannot supply you.

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INSTANT HEAT for Soldering, Radiator Repairing, Etc.



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Whether the job is lead burning, battery sealing, fender straightening, radiator soldering or loosening a rusty or corroded nut, the Torit No. 13 Torch is always ready at a second's notice to serve you, and the price is wonderfully low. It is handy for soldering tinware, babbiting, joining light tubing, aluminum soldering, soldering electrical connections, etc.

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\$750

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Special Offer

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\$10.00**All-Wool
Heavy Jumbo
Sweater Coat**

Only

**50c
DOWN**

Send only 50c with the coupon. This heavy, pure virgin wool jumbo sweater comes on approval. Money back instantly if you ask for it. Don't be too late—order now.

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This is a splendid big sweater at a bargain price. Every fibre pure wool. Heavy rope stitch. Large fashioned shawl collar. Two large lined pockets. Close knitted wristlets. Ivory buttons to match. Made in big full size in rich fast colors. Nothing so practical for fall and winter wear. Sold by most stores for \$10.00, all spot cash.

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Learn to buy the Elmer Richards way as thousands of well satisfied men are doing. Everything you need in clothing or shoes and you pay in monthly sums so low you will never miss them. Strictly dependable qualities only. See this big sweater bargain on approval. Send coupon now.

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Don't miss this. The supply is limited. You take no risk. We stand back of this sweater. Money back if you say so. Send coupon now with 50c. Don't be too late; send coupon now.

Elmer Richards Co.
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Write for our
Free Bar-
gain Catalog
of men's,
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shoes. Every-
thing on
small month-
ly payments.

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I enclose 50c.
Send Heavy Wool Sweater No. F-12. Size.....Color.....
If I am not satisfied when I receive the sweater, I can return it and
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UNLIKE ALL OTHERS!

One to Six Pump-Strokes Compresses Air to Any Shooting-Force Desired

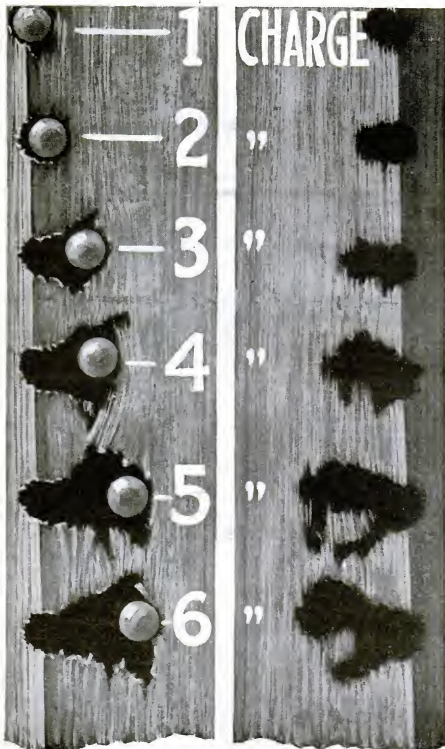
Three Strokes for Ordinary Shooting



THE BENJAMIN

This illustration shows an inch block of wood (double size) penetrated to different depths by a Benjamin Air Rifle using one to six charges of air.

This Is a Feat No Other Air Rifle Can Duplicate



is the gun you have been looking for. For target practice and for hunting rabbits, squirrels, gophers, rats and frogs it has no equal. It is the most powerful, accurate and reliable compressed air rifle made. It has a far greater shooting range than any other. Imagine bringing down rabbits with an air rifle! You can do it with a Benjamin.

The BENJAMIN

is the ONLY PUMP GUN MADE using compressed air. SIMILAR TO AIR DRILLS AND HAMMERS. It does not lose shooting force after long use. The BENJAMIN is the only air rifle with the shooting force under the operator's control. It can be loaded to shoot weak or powerful as desired, from one to six strokes of the pump giving all the power wanted. It is absolutely safe; accidental discharge is impossible. Furthermore, after being charged with air, it is ready for instant use at any time after the shot is placed in the barrel.

The BENJAMIN

is mechanically perfect. It is the only air rifle not requiring frequent repairs, customary in all spring guns.

Price **\$5⁰⁰** Post-Paid

Write for descriptive folder giving full details of this wonderful air rifle.

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*Amo. Mariano Fortuny, Società
Leonardo da Vinci*

Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE *Milan, Italy.*

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 38

DECEMBER, 1922

No. 6

9516

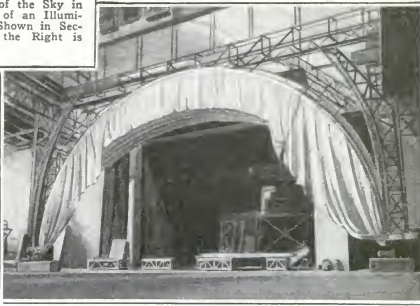
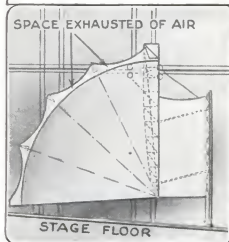
Realistic Sky for the Stage

IN order to give a much better representation of the sky in theatrical stage settings than is possible with customary scenery, a Spanish painter conceived the

idea of using as a background for the stage a structure in the form of half a cupola with its concave side turned toward the spectators. This vaulted sur-



Above Is a Lifelike Reproduction of the Sky in a Rural Stage Setting by the Use of an Illuminated Vaulted Background. It is Shown in Section at the Lower Left, and at the Right is Seen Folded



DESIGNED BY COURTESY OF LAROUSSE MENUEL

face is illuminated by light reflected from the upper axial point of the semicupola, and therefore uniformly distributed over the entire surface, giving a natural representation of the vaulted sky. The most recent example of an installation of this kind is at La Scala theater, in Milan, Italy, the second largest theater in Europe, built in 1778, and with a seating capacity of 3,600. The cupola consists of a frame with five arched steel ribs shaped spherically and all pivoted at the two lower diametric points of the semicupola, which has a span of 69 feet. Of these

ribs the front one is fixed and the others are movable. The outer and inner surfaces of these ribs are entirely inclosed between two sheets composed of an airtight fabric. They are so shaped that when the air in the space between them is partially exhausted, by means of a suction fan, the under sheet is inflated into true spherical form, and the outer sheet is supported by the ribs. To fold the apparatus, first the lower rib is raised by a cable and winch, then the other three are drawn up successively until all come together at the fixed front rib.

HUMIDIFIER AND DEODORIZER IS MINIATURE FOUNTAIN

Humidifying and deodorizing the air in a home, theater, hotel lobby, and similar



Humidifier in Action, Showing How the Fine Sprays of Water are Thrown into the Air by the Small Motor Concealed in the Dome

places, may be efficiently accomplished by the use of an appliance which operates as a miniature fountain. It resembles the now rather commonly seen electric foun-

tains, except that instead of a score of water jets, it throws 50 fine sprays of perfumed water into the air. The height of these sprays is regulated by a small centrifugal pump, driven by a $\frac{1}{10}$ -horsepower motor, which in turn is controlled by a rheostat. The entire outfit weighs only 15 pounds. To increase the artistic appearance, two lamps are mounted under an art-glass or ivory-tinted dome, the whole yielding a beneficial effect.

MODERN MACHINERY PROMOTES WORK OF ARCHÆOLOGISTS

Few of the difficulties that have hitherto interfered with the work of exploration in Mesopotamia will have to be contended with by the joint expedition of the British Museum and the University of Pennsylvania Museum, in their exploration of the ruins of the city of Ur, the ancestral home of the patriarch Abraham. This expedition will be fully equipped with excavating machinery and means of transportation that will make comparatively easy the exploration of these ruins that have been buried for 3,000 years. A military railway and motor trucks will maintain communication with headquarters of the expedition at Bagdad.

ADVENTURER CROSSES PACIFIC IN A CHINESE JUNK

Rivaling the most daring exploits of history is the feat of Capt. George Waard, world adventurer, who, with his wife, a nine-year-old son, and a crew of three, has completed a 5,300-mile voyage in a frail Chinese junk. He arrived at Victoria, B. C., recently, 91 days from Shanghai. Christopher Columbus in his voyage across the Atlantic had a ship of 100 tons and a crew of 52 men, experienced sailors. Of Captain Waard's crew of three, two had never been beyond the

confines of Hongkong harbor, and his fantastic-appearing boat is of but 23 tons. The trip, made in exceptionally rough weather, stuns the imagination. At the very start, the treacherous typhoons of the East swept the frail craft far northward. Three times the rudder was carried away, while great heavy swells broke over the boat, threatening to capsize it at every turn. Numerous storms were encountered. That he should arrive at all, seems to many to be almost a miracle.

Ingersoll Electrical Products Co.
109 W. Austin Ave.
Chicago

Christian Science Monitor
10/10/22

451 Cmt. H. is Mc Naughton
242 Beechwood Ave, Victoria, B.C.,
Canada

The Chinese Junk "Amoy,"
in Which Captain George
Ward Recently Made a
Thrilling Voyage from Shang-
hai, China, to Victoria,
British Columbia



A Close-Up of the Party: The
Captain is Shown in the Center
with His Son. In the Right
Foreground Is His Wife, a Na-
tive of China. The Three Men
Acted as Sailors, Though Only
One had Been to Sea Before

Com. J. R. Winters

702 West 12th National

824

Frank Peltz

POPULAR MECHANICS

304

BROADCASTING PHOTOGRAPHS AND MOTION PICTURES

The broadcasting of motion pictures by radio has been given interesting possibilities by the use of prismatic rings. This new optical shape of glass was

the picture, and is thus impressed on the wireless waves, which are picked up by the receiving station and translated in a similar manner into picture values on the screen, resulting in a reproduction of the picture at the sending station.

SPECIAL DIRECTORY EDITION
FOR CITY'S 300TH YEAR

570

Commemorating the city's 300th year, the 1923 edition of the New York Directory will possess several striking and interesting features. The book will have photographs of the first city directory, which was published in 1786 and contained the names of such historic personages as Aaron Burr and Alexander Hamilton. The story of the city will be represented by reproductions of announcements and advertisements that appeared during successive years, from the time when New York was only a village down to the present period.

N.Y. Times 10/2/22 P.10

WINDMILL ATOP CITY HOME
FEEDS ELECTRIC LIGHTS

232

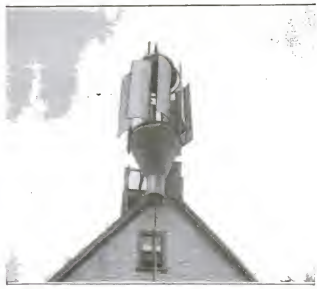
Electric light practically without cost is obtained by a resident of East Cleveland, Ohio, who has erected on his roof a large windmill which provides enough energy to furnish light for all the lamps in his home. A special one-kilowatt generator is used, and the house bulbs, of standard make, consume 32 and 40 watts. The windmill itself consists of eight perpendicular "sails" attached at top and bottom to circular revolving frames. The entire structure is about 15 feet high, and is 50 feet from the ground.



Copyright, Harris & Ewing
The Feature of This Radio Set for Broadcasting Photographs and Motion Pictures, Is a Prismatic Annular Rim Rotated at High Speed

but recently perfected and has already been applied to high-speed photography, continuous motion-picture projection machines, direct-reading ground-speed meters for airplanes, and seems adapted to a rather wide use in scientific and engineering work.

The warped contour of this circular ring of glass, when rotated across a beam of light, is equivalent to a prism with constantly changing angles between its faces, and gives an oscillating effect to the ray of light emerging from it. Thus a ray of light striking the surface of a picture, will travel across the picture from top to bottom or from one side to the other, depending upon whether the axis of rotation of the prism is horizontal or vertical. In the instrument for the broadcasting of pictures, two of these prismatic rings are used with their axes at right angles, and one is rotated many times faster than the other, giving the effect of covering the picture with that many parallel strips by the beam of light. Sending and receiving sets consist of a pair of the prismatic rings, a photoelectric cell, and a beam of light. Current flowing through the sensitive-to-light cell of the sending set, fluctuates under the influence of the various light values of



Eight-Vane Windmill Which Supplies Electric Current to the Dwelling on Which It is Erected

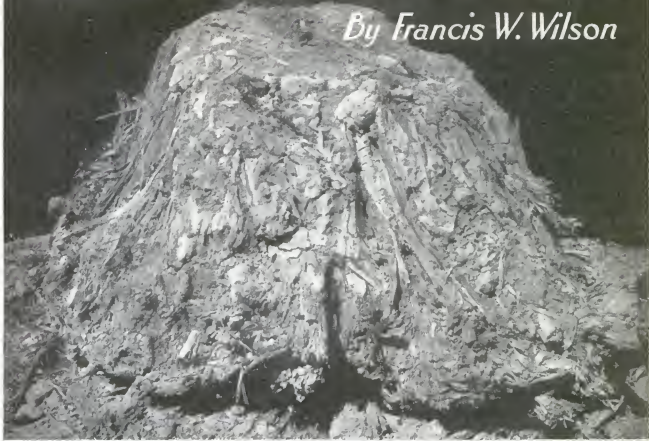
Owner - J. T. Fisher
1885 East Cleveland O.
Penrose St.

C. Francis Jenkins. Washington, D. C.

467 Cont. Francis W. Wilson
927 in St. W. Washington, D.C.

STUMPS 10,000 YEARS OLD

By Francis W. Wilson



Fragment of a Tree Stump, Estimated to Be at Least 10,000 Years Old, Which was Recently Found 40 Feet below the Surface in Excavating for Building Foundations at Washington, District of Columbia: The Original Tree Was More than 14 Feet in Diameter

467
STUMPS ten thousand years old, in Washington, D. C.!

How do we know they are that old? Geologists from the Geological Survey are responsible for that estimate. Perhaps even this age is underestimated. The stumps, excavated from a depth of 40 feet below the present surface of the ground, have probably been immersed in water ever since some stupendous convulsion buried them. Kept constantly wet, they would be preserved indefinitely.

Four of these stumps, uncovered in excavating for the foundations of a new hotel, at the corner of Connecticut Avenue and De Sales Street, were more than 14 feet in diameter.

Forty-four feet in girth!

Try to picture the site of our capital city, as it looked in the day when these forest giants towered higher than the Washington Monument. Imagine forests about the site of the White House, rivaling in impressiveness the world-famed California redwoods.

That is not the only amazing thing in this, today's, unearthing of these gigan-

tic stumps; for the Bureau of Standards asserts that they are the remnants of trees of tropical growth.

Certainly the wood resembles none which American inhabitants have ever found in this latitude. In fiber it is similar to cypress, and slivers flake off from the short bit of trunk above the roots, much as cypress would. Even in the tropics of Central America, trees 14 feet in diameter would be a startling discovery in the present age. No portions of the tree trunks belonging to these big stumps were found in the excavations, excepting the short portion attached to the roots. The stumps were found imbedded in a solidly compacted mass of wood.

This stratum of wood is 12 feet thick. Over the stratum of wood is a bed of marl, 8 feet thick; and above that, the remaining depth is made up of sandy clay mixed with some gravel. For a depth of several feet below the ground surface, the fill is man-made, and comparatively recent.

It was necessary to dynamite the

stumps and remove them in small sections. On that account no photograph showing a complete stump was obtainable. The largest fragment is a relatively small portion of one stump, and yet it measures more than 5 feet in diameter.

Engineers and contractors, accustomed to the local conditions in Washington, all agree that nowhere else in the city has any similar discovery been made, although excavations elsewhere have frequently been made to greater depths.

Looking down into the broad foundation trenches, I watched the workmen digging and pulling away at pieces of the tough wood densely packed and inter-twisted in the 12-foot-thick layer of prehistoric forest. And watching them, many questions suggested themselves.

How many centuries have elapsed since the site of Washington was a tropic locality, growing trees of such mammoth proportions?

What disaster overwhelmed the vast forest and crumpled it into a solid mass of crushed wood—shearing off these big trees as a man might cut grass with a scythe?

And last, but no less puzzling—what

became of the immense tree trunks? No portion of them was found in the excavations. Aside from the four stumps, the stratum of wood seems to consist solely of crushed and broken limbs.

669 WORLD'S GREATEST STADIUM BEING BUILT IN ENGLAND

Now under construction in England is the world's largest athletic stadium. It will be 800 feet long and 300 feet wide, with a seating capacity of 125,000, and is being built on the 200-acre site of the British Empire Exhibition, which is to be opened early in 1924. The stadium is to be of brick and concrete—a permanent building. For such events as boxing, occupying only the central part of the great oval, the seating capacity could be increased to 175,000. The exhibition buildings and stadium are to be located at Harrow, about 10 miles northwest of London, and it is intended to have the road leading to the grounds widened and extended, besides connecting it with specially constructed railroad lines. American athletic officials have been consulted, and many of their ideas may be adopted.

h. J. James 10/15/22



The Point in the National Capital Where the Trees were Found, Showing Several Large Fragments in the Foreground: The Location Is at Connecticut Avenue and De Sales Street



Four Police Officers in the New York Training School Practicing Marksmanship with an Animated Target: On the Screen are Thrown Moving Pictures of Officers Scuffling with Criminals. Every Hole Made in the Target is Shown by Means of a Light That Flashes for a Period of Three Seconds

NEW YORK POLICE DEPARTMENT HAS ANIMATED RIFLE TARGET

In the New York police-training school an animated target has been installed to give lifelike practice in rifle and pistol marksmanship. The target is composed of a small movie screen at the back of a darkened canopy. On this screen are thrown motion pictures of police officers tackling criminals, and scuffling with them. The officers in training are stationed at the front of the canopy, with pistols or rifles, and try to hit the criminal without injuring the officer. Every hit is scored by means of a light which flashes and remains visible for three seconds.

COMPRESSED-AIR RAM USED FOR BALING EMPTY BAGS

Empty cement, or other, bags can be baled very rapidly and economically by the use of a compressed-air ram designed for that purpose. Under the vertical ram, a hundred or more bags may be piled, whereupon a lever is pulled, and the ram comes down, leaving the bags

ready to be tied and trucked away. In cement plants where the ram is in operation, the compressed air can be used for



Compressed-Air Ram Used in Cement Plants for Baling Empty Bags: At Least a Hundred Bags can be Baled at One Time in This Machine

other purposes. The ram occupies little space and is easily operated.

*Used in plant of Sandusky
Portland Cement Co., Wisconsin d.H.*

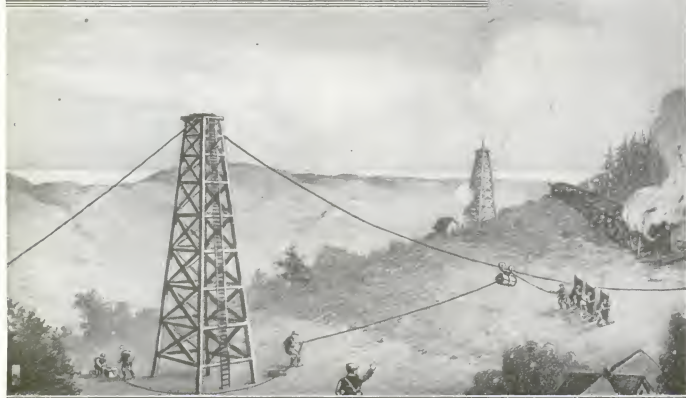
466 *Royal Dutch Shell Oil Co. } Long Beach Calif.*
Signal Hill Oil Field
**USING A DYNAMITE EXPLOSION TO BLOW OUT
 AN OIL-WELL FIRE**
 BY FRED A. HERR, *333 Longview Ave. Detroit Mich.*



Workmen Approaching Burning Oil Well in the Fight to Extinguish the Flames Which Rose 100 Feet above the Mouth of the "Gasser"

A CONCUSSION that reverberated from the walls of San Gabriel Mountains and shook houses in Long Beach, Calif., ten blocks away, occurred when an oil company exploded 100 pounds of gelatin dynamite over the blazing mouth of Wilbur No. 1 oil well in the Signal Hill oil field recently, to extinguish the fire.

The oil well broke out as an uncontrollable "gasser" while bailing for a water test was under way at the 2,400-foot level. When the cement plug had been drilled out and bailing started, the gas burst forth, belching volumes of mud and water 125 feet into the air. It came at the rate of 30,000,000 cubic feet daily, with a force of 3,000 pounds to the square inch. It demolished the derrick, tossed rig irons and drilling tools around like matches, and spouted heavy sections of cement and rock formations from the well. For 12



In the Above Picture Workmen are Seen Hauling a 100-Pound Package of Dynamite in an Asbestos Container, along Explored as It Hung within a Foot of the Well, and the Force of the Explosion

hours the gas roared forth with undiminished force.

Two minutes after midnight, while the oil company with a picked gasser crew made efforts to "kill" the gas with introductions of heavy mud and water, a spark from a rock striking against the casing, ignited the vapor. In a twinkling the seething tower was transformed into a livid pillar of flame, shooting more than 100 feet into the air. For 12 more hours the burning gasser roared defiance to the efforts of the crew to kill it. Its light was seen by seamen off the coast of San Diego, 150 miles south.

Two near-by derricks soon fell, their bases burned away. An oil-field fire seemed imminent. In this emergency the oil company resorted to heroic measures.

At Taft, Calif., in the heart of the central California oil country, lives Ford Alexander, king of gas-well conquerors. He was summoned to Long Beach and given free rein to put out the intense fire.

Alexander brought his own crew down from Taft, and dressed in fireproof asbestos coat and trousers to resist the intense heat, he himself approached the flaming gasser to inspect the crater and well fittings. He determined to extinguish the fire by exploding a charge of dynamite over the well to snuff out the blaze in the same manner that a heavy gust of wind blows out a candle.

Two 30-foot wooden towers were erected on either side of the well and a one-inch steel cable strung between them. One hundred pounds of gelatin dynamite was wrapped in asbestos paper, connected with a detonator and attached to a reel running along the cable. Asbestos-clad workmen, approaching behind asbestos shields which they pushed out before them, pulled the dynamite along the cable till it hung suspended within a foot of the well. A wire connected the charge to the detonator 100 feet away.

When the dynamite charge was exploded by pressing the detonator, it blew out the flame with a terrific blast, tearing a 15-foot hole in the side of Signal Hill. The force of the explosion acted to separate the column of fire by blowing part of the gas back into the well. When the gas returned to the surface, the flames had been dispersed. The well spouted gas and sand for several hours more before it was completely killed with mud and water.



a Cable Suspended between Two Temporary Towers Erected in Line with the Burning Oil Well. The Dynamite was Effectively Put Out the Flames Which had been Burning for Over 12 Hours

Enb. Chas. Claude Wagner
 4731 S. Vermont Ave.
 Los Angeles, Calif.
 830
 556

Johnson Associates
 Inc. 557 10th St.
 New York City

POPULAR MECHANICS
CHILDREN'S TOY VEHICLE
USED BY LAME MAN

A toy vehicle, popular with children, is being used practically by a man in a

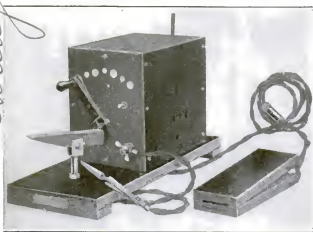


The Second Seat on This Toy Makes It a Convenient Means of Getting About for the Lame Man

western town who has partly lost the use of his lower limbs. Sitting on a second seat, built a foot or so above the original low one, he finds that he can easily propel himself with the aid of his crutches. The vehicle also furnishes a means of exercising the limbs, which otherwise might be neglected.

ELECTRIC SOLDERING MACHINE
428 FOR JEWELERS' USE

An improved machine for use in the manufacture and repair of chains, catches, rings, silverware, and other jewel-

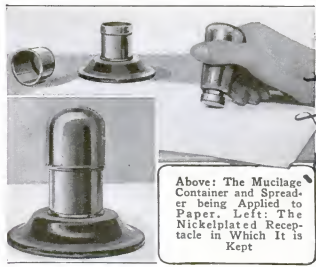


This Electric Soldering Machine Has Three Different Heats for the Repair of Jewelry, Which It Accomplishes Quickly and Neatly

elry, provides three different heats for electric soldering and is said to be shock-proof. A suitable piece of solder is placed upon the carbon electrode, the article is gripped by the tweezers that form the other terminal of the circuit, flux is applied, the joint of the article is put in contact with the solder, and the current is turned on by a foot switch. As soon as the solder flows, the circuit is broken by releasing pressure on the switch.

MUCILAGE SPREADER UTILIZES
489 ATMOSPHERIC PRESSURE

Cleanliness and economy are claimed to be the distinguishing features of a new mucilage container which is also a mucilage spreader. The device consists of a bottle, at the neck of which is stretched a piece of fabric. It is kept, neck to the bottom, in a neat nickelplated receptacle. When removed, atmospheric pressure is sufficient to keep the mucilage from oozing through the fabric. This resistance is overcome, however, when the neck touches the paper or whatever is to



Above: The Mucilage Container and Spreader being Applied to Paper. Left: The Nickelplated Receptacle in Which It is Kept

receive the application. Druggists have often used an old bottle and gauze in a similar way.

WALRUS HIDES ARE VALUABLE
544 FOR METAL POLISHING

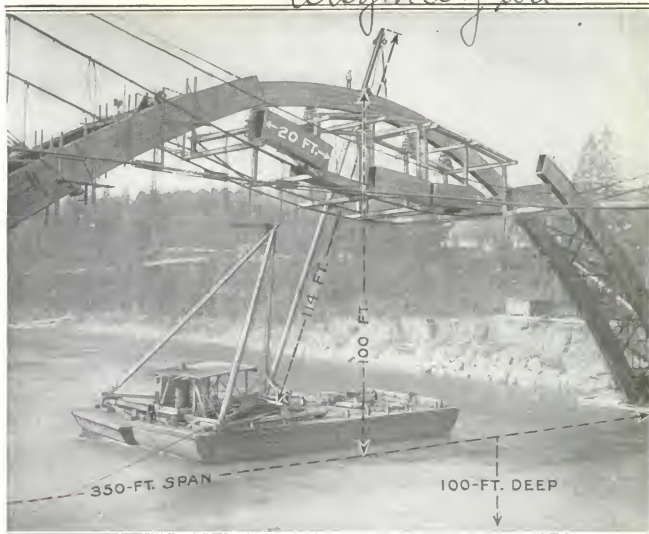
Walrus hides are constantly increasing in value for metal-polishing purposes, despite the fact that the process of tanning them requires from one to two years' time. When properly tanned, however, the flexible fiber of this leather will satisfactorily hold such materials as pumice, crocus, emery, etc., and these, together with its own peculiar abrasive qualities, produce on any metal a brilliant and durable polish.

Escrene, Tweedy & Co.
 109 Duane St.
 New York City

Smartchild & Co.
 29 E. Madison St.
 Chicago

Info - Hoffman - 322
 544
 April 22

Oregon City, Ore.



Method of Hoisting into Place Each of the 20-Foot Sections of the Steel Arch from the Deck of Twin Barges: One Barge Was Not Wide Enough to Furnish an Adequate Base for the Tripod of the Derrick, and So Two were Lashed Together in the Manner of a Catamaran

546 TWIN BARGES WITH ONE DECK AS SUPPORT OF A DERRICK

In the building of the long-span, concrete-steel bridge at Oregon City, Ore., described in the July, 1922, issue of this magazine, where the water was too deep for the erection of falsework, twin barges, in the nature of a catamaran, were used for hoisting the 20-foot sections of the steel arches that formed the main members of the central 350-foot span. The twin barges were decked over, and supported a powerful derrick with a 114-foot boom, allowing the tripod of the derrick to be widely spread so as to fully counteract the one-sided pull from the weight of the arch sections when swung sideways into position. Each of these 20-foot steel arch sections, of box-girder construction, was 2 feet 7 inches wide, with a depth varying from 6 to 10 feet, and a weight varying from 6 to 13 tons. In this manner the arch was built up section by section, riveted together, and when complete, was covered with a con-

crete coating. The support for this coating was formed of a wire mesh tied to a network of $\frac{1}{4}$ -inch rods that were spot-welded directly to the plates forming the walls of the steel arch.

484 LINEN TESTER HAS POINTER TO HELP COUNT THREADS

A new linen tester for counting the threads in the fabric is designed with a movable pointer,

which makes this work easier. The device consists of the usual two parallel surfaces held a few inches apart with the magnifying glass in the upper surface while in the opening of the lower plane has been arranged a movable pointer. The pointer can be moved to indicate the threads as they are counted.



Wm. Hoffman
A. 515-1365 Broadway,
New York City

Lowell & Co. 832
Philadelphia, Pa.
POPULAR MECHANICS
EDGING MACHINE TRIMS SOD
FROM SIDEWALK BORDER

Trimming sod from the border of sidewalks has been simplified by an appliance



having a long handle to which is affixed a circular steel cutting disk. The disk has a flange which rests on the edge of the walk, permitting the sharp tool to be guided along the side as it cuts away the turf, thus improving the

appearance of the lawn and providing a drain along the edge of the sidewalk.

ELECTRICAL INCUBATOR VERY SIMPLE IN CONSTRUCTION

A new electrical incubator, wired to connect to any lamp socket, is in the form of a box, 16½ inches square, 12 inches high, and weighing empty only 22 pounds. It has a capacity of 50 eggs, which are placed upon a layer of sand in the bottom

of the lower half of the box. The upper half, hinged to the lower, has mounted inside it a large, bright-metal concave reflector, insulated with cotton batting, and facing the lower half of the box when closed. A thin metal plate covers the upper half of the box, and has on the side facing the reflector a socket for an electric lamp, and wired to this on the other side, a novel contact breaker, triangular in shape, the point of which curls up when overheated, cutting off the circuit, so that the incubator never exceeds the proper hatching temperature.

EXHIBIT OF 655 DIFFERENT TYPES OF LIVE BACTERIA

As many as 655 different kinds of live germs have been collected by the American Museum of Natural History at New York, and are being transferred to the Society of American Bacteriologists at Washington. This germ collection includes practically every well-defined type of bacteria that is known. Following its customary policy, the museum sent cultures and subcultures, free of charge, to bacteriological workers all over the country, and more than 700 different institutions have taken advantage of this liberal policy. A service of this kind enables students of biology to work with official material, and extends the field of usefulness of the museum.



Left: Electrical Incubator with Its Upper Half Closed, Showing the Triangular Contact Breaker That Acts as a Thermostat to Maintain a Uniform Temperature of 103 Degrees. Right: Upper Half with Its Cover Down, Showing the Heating Lamp, and the Bright-Metal Concave Reflector with Cotton-Batting Insulation

AC-Spradling, Nittledafer, Nitch

N.Y. Times 10/14/22

490

Capt Francis B. Meece
Heriot Bay, B.C. Canada

One of the Immense Platforms Which are to be Seen on Easter Island and Which Consist of Huge Blocks of Squared Stone That have been Cleverly Joined without the Use of Cement of Any Kind

MYSTERIOUS EASTER ISLAND

By FRANCIS DICKIE

AT the end of August, 1922, a cable reached America from Sydney, Australia, bringing probably the last scientific word about that most mysterious of places, Easter Island, that lonely dot in the Pacific 2,300 miles west of Chile, and when discovered by Roggeveen in 1772, removed by 1,500 miles from the nearest inhabited land.

The cable reported the arrival at Sydney of Prof. Macmillan Brown, who has been carrying on for some time extensive research work on Easter Island, investigating the huge platforms and unfinished gigantic sculptures which are found among the finished images that lie scattered in considerable numbers on the island.

Around these great stone monuments centers the mystery of Easter Island. Since 1772, when the island was discovered, various scientific men for 200 years have been continually occupied theorizing regarding the relics of a lost people represented by these sculptures, a people believed to have been entirely

different from the races dwelling today in the South Seas. Through these gigantic stone images the truth of the belief in Atlantis—that wonderful continent supposed to have sunk eons ago—seems to be borne out.

The cable from Sydney quotes Professor Brown as having finally arrived at the conclusion that a bygone Pacific empire ex-



Two of the Many Images Which have been Found in Caves on the Mysterious Easter Island and Which Show the Tendency of the Workman to Portray a Certain Type

isted, one of great extent, which disappeared in the dim past when a great submergence took place. Of this great continent, Easter Island was evidently a part. The submerged-continent theory is strikingly borne out by certain of the sculptures being in an unfinished state. Both the completed and the incompleted ones are to be seen scattered in various parts of the island in large numbers. They are cut out of a solid gray lava which is found in the extinct crater of Hoti Iti. The images vary in size from 5 to 38 feet in height, but are mostly from 15 to 20 feet, while some are as short as 5 feet.

In the crater are many unfinished images still undetached from the face of the pit as though some great catastrophe had overtaken the ancient men while at work, killing them instantly, or forcing them to leave, never to return. One unfinished carving is 68 feet in length and 10 feet wide. The design of all is that of a human body, ending at the hips, the arms close to the sides. The head is flat, surmounted with a crown of red stone

brought from another crater. Upon the face of each image is a well-defined look of disdain. A great many of the images are now thrown down, but here and there some remain upright. In addition to the images are immense platforms of squared stone facing the sea. Like all the work of ancient peoples, the stones are cleverly joined and held together without the use of cement. The platforms are rectangular, being in some cases 300 feet long, 20 to 30 feet wide, and about as high. Upon the platforms many images lie overthrown.

The eminent traveler and antipodean explorer, Clement Wragge, who returned

in 1912 from Easter Island, was persuaded that the rock carvings he discovered near the Bay of Islands, and the cyclopean monuments on Easter Island, are of very ancient date. Discussing the origin of these relics, he writes: "The people who built the wonderful statues and cut the marvelous inscriptions on Easter Island had nothing to do with the Polynesians, but are allied to those peoples dwelling in Central and South America long ages ago. In fact they are to be referred to an Atlantian race."

Dr. Paul Schliemann, a grandson of the archæologist, Heinrich Schliemann, and

who has given much attention to this subject, writing in the London Budget about the same time, tells us: "I am as satisfied as I am that I exist, that before the beginning of the Eocene Age, perhaps in the Cretaceous period, a great continent inhabited by a civilized race existed. The American Indians are descendants of this race."

These earlier reports by such authorities as Wragge and Schliemann, and the words just recently cabled

about Prof. Macmillan Brown, fortunately can be still further added to by the report of a noted Canadian traveler, Frank Burnett, Sr., of Vancouver, B. C., maker of the world's greatest South Sea collection, and who has for many years been interested in the mystery of Easter Island. Like the men already mentioned, Mr. Burnett has been impressed by the theory of a once existing continent near, or perhaps joining, South America, of which Easter Island and some others in the South Seas are evidently survivals of the tremendous cataclysm which ages ago carried this empire beneath the sea, leaving only these abruptly deserted monuments as



Frank Burnett, Senior, of Vancouver, British Columbia, Who is Said to Be the Possessor of the Largest Collection of South Sea Curios, and Who is Interested in Easter Island



At the Left is Seen a Stone Image Which was Found in South America and Which is Believed to Be the Work of a Race Closely Related to the Ancient People of Mysterious Easter Island. At the Right is an Unfinished Easter Island Monument, the Lines of Which Are Strikingly Similar to the Other

proof of a people infinitely older than the present Polynesian people who inhabit the near-by South Pacific islands.

During the last 25 years, Mr. Burnett has spent much time in the South Seas. In 1919 he traveled through Central and South America examining a great many of the there existing ancient monuments in an endeavor to establish a connection between the early races dwelling here and that people who carved the sculptures and built the platforms on Easter Island. From this journey he arrived back in Vancouver only a short time ago.

Believing that the first inhabitants of Easter Island were of a kindred stock to the prehistoric inhabitants of South America and were not Polynesians, Mr. Burnett substantiated his theory in a personal interview as follows:

"For my part," he said, "having seen the Easter Island sculptures and those at the ruins of Tiahuanaca, near Lake Titicaca in Bolivia, and having noted their great resemblance, I am in favor of the theory that they are both the handiwork of a race that inhabited portions of South America and the eastern groups of the South Pacific when the latter comprised a much greater land area than they do at present; a race that dwelt in a great

empire and passed away ages before the rise of the Inca empire, and before the Polynesians left their Asiatic home to wander eastward on their long, long drift to the Pacific islands. The principal, in fact the only, difference between the Easter Island images and those of Tiahuanaca, consists in the design of the ear. At the latter place, this organ is depicted in the natural shape, while on Easter Island the lobe is largely distended, in the same manner that the present-day Solomon Islanders and some of the New Guinea tribes are accustomed to treat their ears. I am fully in agreement with Prof. Macmillan Brown regarding the possibility of a bygone continent being submerged, and that all available evidence points that there was a sudden abandonment of the work, very probably due to a cutting off of food supplies. Perhaps the workmen were forced to eat each other, and all finally died. When the Polynesians came is, of course, also a matter of conjecture, but their arrival must have been ages later. I have just finished a book, 'Summer Isles of Eden,' which I have been engaged upon for many years, which incorporates all the information gained in 25 years of travel in the South Seas, and none of the

very extensive material of great interest there was of more fascinating interest than endeavoring to solve satisfactorily the strange mystery of Easter Island."

That a highly civilized people of vast antiquity dwelt upon the continents of North and South America, is now indisputable. That they peopled also a continent which has vanished, seems very probable. Of this, Easter Island seems to tell. This is one of the most fascinating stories in the vivid history of the race of man. In the limited space here permitted, it is still possible to give a complete, yet concise, summing up of the whole subject to which Easter Island sculpture has given rise, for the Canadian archaeologist, W. D. Harris, D. D., LL.D., in the "Annual Archaeological Report" of the province of Ontario for 1913, had already made out a very remarkable case in favor of all the facts which the investigation of Macmillan Brown, Frank Burnett, Wragge, Schliemann, and others have borne out. He writes as follows:

"In the ruins of the pre-Columbian cities of Yucatan and Central America we see the most elaborate forms of sculpture, the remains of a people skilled in architecture, sculpture, and drawing, and, beyond doubt, excelling in arts that have perished. The architecture and system of writing of these prehistoric people are

different from those of any other known race, ancient or modern. They stand alone. Without models or masters from abroad, their architecture originated among themselves. The regions now known as Yucatan, Chiapas, and Tabasco were the cradle land of primitive American civilization. In these regions we find the tidal remains of an ancient race, which welled up from its primal springs and overflowed and rolled on over the entire continent (North and South America). All European, African, and Asiatic languages have been traced back to their sources, but the Nahuatl and its cognate tongues of America stand alone, and throw no light on the origin of the people. Philologists say it differs radically from all other known languages. Comparison with the Sanskrit, the Hebrew, the Phœnician, Japanese, Chinese, Celtic, or Scandinavian languages establishes no affinity between them and any primitive American tongue."

Though the above-given facts regarding Easter Island seem to be about the last word on a most fascinating subject, perhaps in the future some still more interesting evidence may be brought to light regarding the wonderful men who in dimaged time carved the great works of stone, and who were still working upon them when the continent sank.

APARTMENT HOUSE DYNAMITED TO PREVENT ACCIDENTS

Dynamite was resorted to in the wrecking of a condemned four-story apartment

house in Cincinnati, the foundations of which were weakened by the excavations of a rapid-transit company. With the streets in the vicinity roped off and policemen stationed at every intersection, the

work of demolishing the building was carried on before thousands of spectators. Several persons, onlookers a block distant, were slightly injured by the flying débris, while the firemen stood by in readiness to quench any resultant flame. Three days of dynamiting, which rocked the other structures in the locality, were required before the building was leveled.

Great quantities of acorns, harvested from the extensive oak groves along the lower Columbia River this fall, were used to fatten hogs, turkeys, and chickens.



Apartment House Which was Dynamited by Wrecking Crews, Showing Part of the Structure Demolished

R.S.
 And L. R. Sickenorff, Cincinnati
 Dec 11, 1913

575 The Sea Sealed Co

POPULAR MECHANICS, Conn.

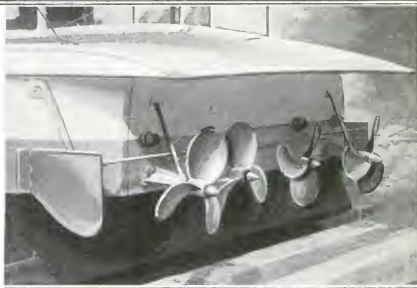
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HYDROGLIDERS WITH SURFACE PROPELLERS



First of a Fleet of Sealeds That are being Built for Service on the Shallow Rivers of Colombia, South America: The Boat Has Accommodations for 20 Passengers and Their Baggage

The first of a fleet of newly designed sealeds to be built for high-speed transportation of passengers and freight on the shallow rivers of Colombia, South America, was recently launched in Connecticut. These sealeds, like the hydrogliders described in Popular Mechanics Magazine for February, 1922, when traveling at high speed skim the surface of the water instead of plowing through it, but unlike the hydrogliders which are driven by aerial propellers, the sealeds are driven by four surface propellers, of special design and method of installation. The hull of these new sealeds is 50 feet long, 12 feet wide, and its bottom section is of the inverted-V type that does not displace the water sideways, maintaining, therefore, a positive pressure beneath the bottom of the boat, which is of advantage in its operation as a glider. The steering is done with side-plate rudders that are practically extensions of the sides of the hull, and in straight-ahead traveling offer no resistance to the water. Each sealed carries 20 passengers and their baggage, a total weight of 5,500 pounds, together with 500 gallons of gasoline, at a speed of 30 miles an hour. The power plant consists of four six-cylinder motors, staggered in their installation, and each of



Stern View of the Sealed, Showing Its Four Staggered Propellers, and Also One of Its Side-Plate Rudders: The Propellers Have Unusually Heavy Bearings That are Lubricated from an Inboard Mechanical Oilier

200 horsepower, directly connected to its individual propeller.

CAMPAIGN TO SAVE EYESIGHT WILL BE COUNTRY-WIDE

A nation-wide campaign of eye conservation is planned by the Eye Sight Conservation Council of America in an effort to prevent blindness in this country resulting from avoidable causes. Figures gathered by the council show that, in 1910, there were 57,272 blind persons in the United States, or 623 per million of the total population. There were 52,617 in 1920, or 498 for every million of population. Coöperation in the movement has been promised by the Federal Bureau of Education, the Bureau of Standards, several universities, and various civic organizations.

W. H. Jones
10/13/22 P. 16

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Oct. 1921 - 58
June, 1922 - 204

436
Capt. H. J. Hoopes, 1411 W. Roosevelt
Ave., Chicago



(Royal D. Thomas)

IT may seem like painting the lily that anything man might accomplish would add to the thrill experienced in contemplating the grandeur of the Grand Cañon of the Colorado River, of which it has been written: "Those who have long and

AIRPLANE LANDS

Treacherous Air Currents Spectacularly
Motion-Picture Operator—

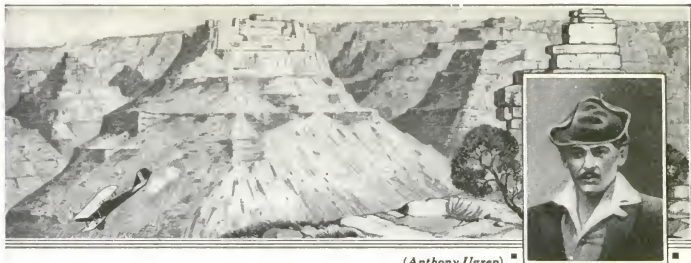
By R. C.



PHOTOS COPYRIGHT, FRED HARVEY, COURTESY SANTA FE SYSTEM LINES
Above: The Plane is Seen Circling above the Rim of the Grand
Cañon. Below: The Plane at the Beginning of Its
Drop into the Cañon

carefully studied the Grand Cañon of the Colorado do not hesitate to pronounce it by far the most sublime of all earthly spectacles." This extraordinary sensation was provided for those who were privileged to view an airplane, circling several times above the cañon, suddenly turn and, flying close over the rim, swiftly descend into the depths below until within a few hundred feet of the bottom, where it straightened out and began a spiral climb of 3,000 feet before making a tailspin, from which it turned to a short flight through the cañon, finally making a safe landing on Plateau Point. To the Indians who had assembled in their best paint and feathers, it must have been an awe-inspiring sight, similar to that of earlier generations of red men who saw the centaurlike cavaliers of the Spaniards and the steam train for the first time.

Previous to this flight an airplane had once flown over and slightly below the rim, but no one had dared to attempt flying a plane down into the cañon, on account of the treacherous air currents that were known to exist there. Many rumors were current of small balloons liberated at the bottom, being torn to shreds by the tortuous currents. A flight upward from the bottom was considered equally difficult because of the improbability of being able



(Anthony Ugren)

IN GRAND CAÑON

Negotiated by Former Army Airman and
Indians Gather to Witness Feat
FOLGÉR

to "take off" from the floor of the cañon. In the face of these adversities, Royal D. Thomas, a young man from Kansas who joined the U. S. air service at the outbreak of the war, and with a later record as an acrobatic flier, became interested to perform this well-nigh impossible feat. After some time spent in studying the air currents and in the selection and preparation of a landing place at the bot-

tom of the gorge, he made his plans for the historic flight. On the morning of August 18, Thomas, accompanied by Anthony Ugren, a motion-picture photographer, left Williams, Ariz., in his 180-horsepower plane, and about a half hour later arrived over El Tovar hotel at the rim of the cañon. For the benefit of the cameraman, he made two complete circles and then flew over the forest back of the rim before starting his real flight. As he piloted his plane over the edge of the cañon, an air current rocked the ship, but he was in nowise disturbed, for when high in the air, he turned nose down and shut off his motor as he shot past the rim. This down current of cool



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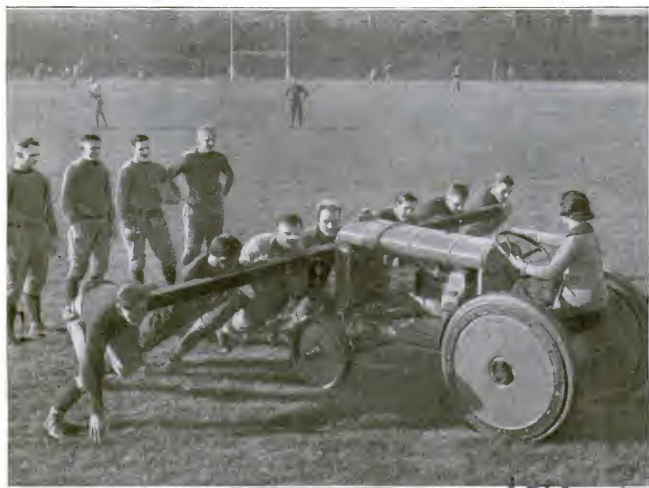
Scene at the Bottom of the Grand Cañon Where Royal D. Thomas is being Photographed with His Plane and Photographer Companion, after the Memorable Descent into the Cañon by Airplane: Other Pictures Showed He Made a Perfect Three-Point Landing



air caused the plane to drop over 1,000 feet into the cañon with such terrific speed that it was found impracticable to take pictures of it during that part of its flight, and the actual descent was accomplished in a little more than a minute. Starting out early the next morning, Thomas completed his flight, ascending from the bottom of the gorge in his plane, the upward flight taking about $4\frac{1}{2}$ minutes. He estimates it would have taken him at least one minute longer on the ascent but for an upward current of air that actually lifted the plane for a vertical distance of nearly 1,500 feet.

THE PLANE AS IT FLATTENED OUT ABOVE ITS LANDING PLACE AT PLATEAU POINT, AFTER ITS RAPID DESCENT INTO THE GRAND CAÑON, WHICH LASTED A LITTLE LONGER THAN A MINUTE

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CALIFORNIA VARSITY LINEMEN HOLD TRACTOR FOR DOWNS

WHEN the husky linemen of the University of California's football eleven "had it out" recently with what is claimed to be a powerfully built tractor, the tractor found it could make little progress toward the enemies' goal posts. The football men, bucking a timber stretched across the radiator, were not only able to prevent the machine from going enough to make downs, but when, after a few moments of play, they had gotten worked up into the spirit of the game, they also managed to run it back for a loss.

International

Light
Electric

566 General Electric Co, Schenectady, N.Y.
National Lamp Works of General
Electric Co
Cleveland, Ohio



On the Flagstaff Is One of the 30,000-Watt Incandescent Lamps, First Shown at the Convention of Illuminating Engineers, at Swampscott, Massachusetts. The Circles of Light were Caused by the Moving Searchlight of a Battleship, a Half Mile Out in the Harbor. Note the "Whitecaps" in the Background

LARGEST INCANDESCENT LAMP IN THE WORLD

566

By BERNARD G. PRIESTLEY,

271 Washington St
Melrose Mass

A 30,000-WATT incandescent-light bulb, having a capacity of 60,000 candle-power, was shown as one of several striking electrical features of the 16th annual convention of the Illuminating Engineering Society, recently held at Swampscott, Mass.

The bulb is the largest of its kind ever made. The amount of light it produces equals that of 4,000 ordinary electric lights of the same type, giving sufficient light to illuminate 200 average homes.

The power required to operate one of the bulbs is equivalent to that needed to run the average trolley car. Two special generators, of ample capacity, were loaned by the army to operate the lamp at Swampscott. The bulb was suspended from a pole in front of the hotel where the electrical experts were holding their convention. The light it produced at night was so powerful it could be seen for sev-

eral miles. Objects a quarter to half a mile distant were readily discernible.



One of the 30,000-Watt Incandescent Lamps, Which Makes a "Lapful" for the Young Woman, and Illustrates Its Size

When the lamp is lighted, a temperature of about 3,500° C. is generated in the filament. The heat is so great that an electric fan is used on the light holder to cool the bulb. Otherwise the glass would soften and the filament would blow out. The glass part of the lamp is approximately 1½ feet long and 12 inches in diameter.

The giant light was made in the same manner as the ordinary-size bulb. It has four coils of drawn tungsten wire. The wire used is .1 inch in diameter, or 50 to 100 times as thick as that of the ordinary bulb. Each coil is 5 inches in length. The bulb is filled with argon gas, as is common with ordinary incandescent lights. Even with the use of a fan for cooling the light, there is danger of it burning out from overheating after it has been lighted 15

*Fire Rate Radiator
Heating Corp.
918 Jackson St. } Knoxville Tenn.*

minutes to half an hour. The ordinary "hard glass" of the type found in the ordinary incandescent light is used. The glass is no thicker, comparatively, than that of a 40-watt household lamp.

Although the amount of power needed to operate one of the bulbs is many times that needed for the household light, the voltage used is only 110, the same as that on the average power circuit in the home.

Thirteen of the lights like the one exhibited have been made, it was announced at the convention. They are designed for use in motion-picture studios. It is claimed that such lights are more suitable than arc lamps because of the absence of the flicker caused by carbon filaments and the softer tone of the light rays.

Two mammoth U. S. Army searchlights, each equipped with a 60-inch projecting mirror and having a lighting capacity figured by electrical experts at 400,000,000 to 500,000,000 candlepower, were used in the illuminating effects for the convention. These lights were set up on the seashore in front of the hotel that served as headquarters for the electrical experts. Three big searchlights were also in operation on the U. S. destroyer "J. Fred Talbot," which lay half a mile out in Swampscott harbor to cooperate in the illuminating program, and was outlined by 350 electric lights. More than a score of smaller searchlights which were operated

from the roof of the hotel building, provided additional light for the display.

Fifty floats, 6 feet in diameter, were anchored in the water a quarter of a mile from shore. Three separate circuits of wires for colored lights were strung to these floats from portable generating stations on the shore. The colors of the lights on the floats were alternated at frequent intervals. The lights were so placed that they formed the initials of the society, I. E. S., these being entirely surrounded by a flare of red fire.

The battery of big searchlights, each operating independently of the others and changing its angle of light projection frequently, produced some striking effects against the background of darkness. Points of land, a half mile to several miles away, were illuminated so brightly that they appeared as natural as in daylight.

HOT-WATER HEATING FROM

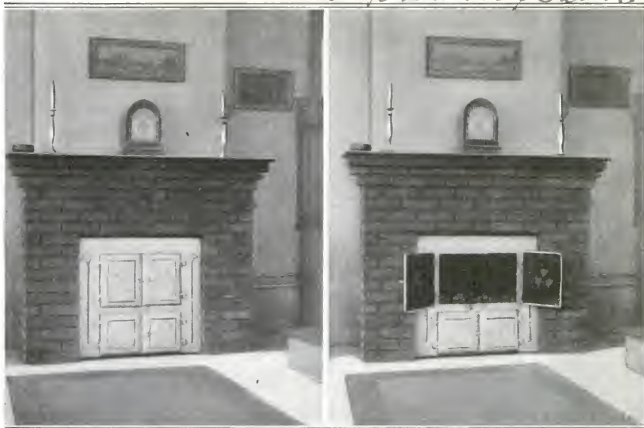
567 OPEN-GRATE FIRE

The advantage of hot-water heating has been ingeniously combined with the cheerfulness of the open-grate fire in a new heating apparatus which is adaptable for any width of fire-grate opening.

It consists of a sectional boiler with hollow grate bars and an iron front and doors. The rear, sides, and fire basket are hollow and filled with water connected to an expansion tank located in



Another Lighting Effect Produced at the Convention: Battery of Searchlights Thrown on the American Flag; the General Lighting of the Surroundings Was So Brilliant That a Chain of Rocks Extending a Half Mile Out into the Ocean, is Plainly Seen in the Background



At the Left is Seen the Fireplace Which Houses the Grate of the Hot-Water Heating System, the Doors of Which are Closed. At the Right, the Upper Doors are Shown Opened, Displaying the Large Aperture for the Fuel, the Burning of Which Yields a Cheerful Open-Grate Fire

the attic. The usual system of piping to the various radiators throughout the house operates in the same manner as any other hot-water system. A coil is placed in the rear of the heater and connected to the regular hot-water tank, and thus hot water is available at all times. The water gauge and thermometer are installed at a convenient point near the heater. As the grate opening (usually in the living room) is located on the first floor, it requires a minimum of attention. A slight raking with the poker on the underside of the hollow fire basket is sufficient to lower and remove the ashes. No dirt or ashes blow into the room, as the draft in any fireplace is greater than the draft in a furnace, due to the larger flue opening.

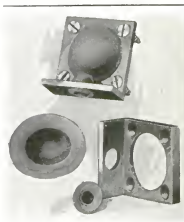
637 SHORTAGE OF HOMES SERIOUS IN ROME

A shortage of 100,000 rooms is the problem now facing Rome, Italy, according to a municipal councillor of that city. The present state of affairs is a consequence of the late war. The rise in price of building materials, simultaneously with that country's entrance into the great conflict, was the cause of a practical cessation of all construction activities. This condition has prevailed for nearly eight

years. The government has attempted to meet the unfortunate situation by appropriating \$160,000,000, which fund is loaned at three per cent to workmen and civil-service employes as a means of stimulating the much-needed home building.

592 PNEUMATIC CUSHION ON JAMB STOPS DOOR SLAMMING

Slamming and rattling doors are simply eliminated by means of a small pneumatic cushion made to fit the door jamb. The device consists of an angular piece of metal with a hollow hemisphere of rubber inserted in the larger side lying against the door jamb, and a smaller similarly shaped piece in the other side which projects at right angles to the jamb. The air inside the spherical rubber pieces deadens the force of the impact. As they wear out, they can be easily replaced by others.



Chicago Daily Journal
 10/12/22

Edw. John Halloran
 212 Woodrow St.
Italy City Calif.

TALLEST CON- CRETE TOWER FOR JAPANESE RADIO

The tallest reinforced-concrete tower in the world has recently been completed in Tokyo, Japan, and will be used to support the aerial of a wireless station. It is 672 feet in height. The lofty structure is built in the form of a chimney, having an inside diameter at the base, of 55 feet, and tapering to 3 feet 6 inches at the top. The wall thickness graduates from 33 inches at the bottom, to 6 inches at the apex. A spiral steel stairway winds up through the interior, landings being located approximately every 150 feet, these connecting to exterior balconies, from which sight-seers can view the surrounding country. Engineers are said to be preparing plans for two similar towers, which, however, will be almost twice as tall, since the success of the initial structure has led them to believe that reinforced-concrete towers 1,200 feet in height are practicable.

THE FUTURE OF OUR NEAREST SISTER PLANET

When several years ago the British Association for the Advancement of Science held its session at Toronto, Can., Lord Kelvin gave a remarkable address in which he stated that it had been found that the primeval rocks of the world contained cavities the contents of

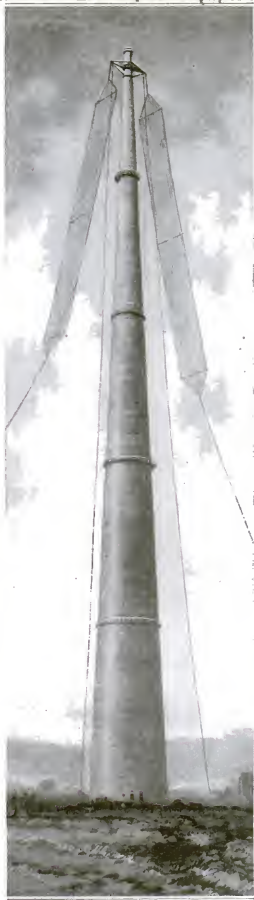
which were water, salt, hydrogen, carbonic-acid gas, and some argon, but no

oxygen. He repeated "no oxygen." As these cavities were formed when the rocks were about to change from the melted, boiling condition into solid rocks, they are bubbles in which were imprisoned samples of the primeval atmosphere of the world, which, therefore, contained hydrogen, nitrogen, carbonic-acid gas, water vapor, and argon, but no oxygen. Billions of tons of oxygen is now mixed with the other gases of the earth's atmosphere.

The venerable lecturer then said that the only agency with which we are acquainted which could unlock the oxygen from the chemical combinations in which it was held, such as carbonic-acid gas and metallic oxides, is plant life using the energy of the sun, and the greater part of the oxygen now in the air came from the separation by vegetable growth of carbonic-acid gas of the atmosphere into its oxygen and the world's deposits of coal.

Since Lord Kelvin died, the methods of estimating the period of time which has elapsed since the primeval rocks first solidified, have grown more exact. The latest estimate sets it in the neighborhood of one billion years.

Recent studies of our nearest sister planet, Venus, suggest some very interesting speculations. The future oceans of the planet are wholly, or in part, in a state of steam and cloud which enswathes the planet and so completely hides the surface that it has been impossible to determine the rate of rotation of the planet,



Reinforced-Concrete Tower, Showing the Method of Fastening the Radio Aerials at the Top of the Lofty Structure, and Also the Balconies for Sight-Seers

Cmt. W.W. Andrews, Regina,
Sask., Canada.

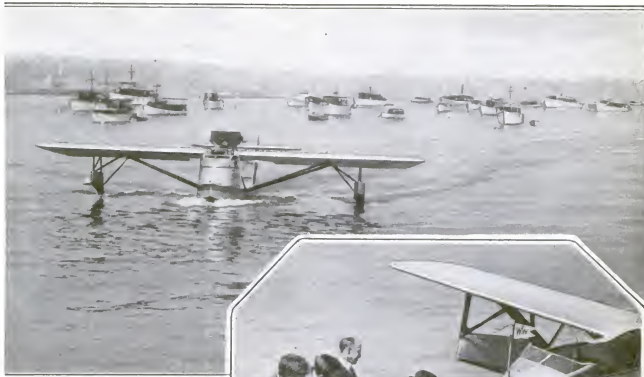
and, therefore, the length of its day. The rocks may yet be in a molten state or still hot after solidification. Most exact spectroscopic study of the atmosphere of Venus has demonstrated the absence of oxygen. Venus, therefore, is in about the same state of development as the earth was from one hundred to a thousand millions of years ago. As both the earth and Venus are parts of the same primeval nebula, the atmosphere and rocks of

Venus will contain combined oxygen in the same manner as the earth. Plant life or some similar agency, the nature of which we cannot guess, must slowly pick out the oxygen, molecule by molecule, if any development of animal life is to occur in the long future which evidently lies before the planet. Venus, therefore, is a younger sister and may repeat with variations our long history, till it reaches the earth's present stage of maturity.

NEW FLYING BOAT IS NAMED FOR WILBUR WRIGHT

The new Wright flying boat, which was recently launched at the Columbia Yacht

club, the latest ideas in the design and construction of flying boats. Miss Wright has been identified with the flying industry since the days of the Wrights' first experiments, when she was associ-



The New Flying Boat "Wilbur Wright," Traveling on the Surface of the Hudson River Preparatory to Making a Flight

Club, on the Hudson River, New York City, was named the "Wilbur Wright," in honor of the pioneer American airman. The christening was done by Miss Katherine Wright in the presence of her brother Orville Wright, the survivor of the famous brothers; Percy Mackaye, the poet-dramatist, and Capt. Vilhjalmur Stefansson, the arctic explorer.

After the christening, Miss Wright took a ride in the new craft, which embodies

ated with her brothers as "business member of the firm."



PHOTOS COPYRIGHT, UNDERWOOD & UNDERWOOD

Miss Katherine Wright, Sister of the Famous Brothers, in the Act of Christening the New Flying Boat "Wilbur Wright"

*Wright Aeronautical Corp.
Paterson, N.J.*

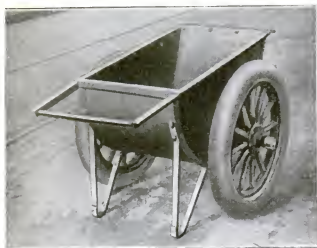
The A. J. Penote Co.
6715 Duinby Ave
540 Cleveland Ohio

846

POPULAR MECHANICS

**PNEUMATIC TIRES ON BUGGIES
USED TO CARRY CONCRETE**

Regular buggies used for carrying concrete are being equipped with pneumatic



Buggies for Carrying Concrete, Equipped with Pneumatic Tires, as Shown Above, are Found to Be Easier to Handle

tires by a Cleveland contractor, who finds that the buggies so equipped are easier to handle than the old type. In wheeling over rough streets it was also found that the tires help to keep the mixture from separating. This allows the concrete to be carried a much greater distance than formerly.

ual requirements. The rifle has a heavy barrel, 26 inches in length, tapered from 1 1/8-inch diameter at the chamber to 7/8 inch at the muzzle. It is of finely finished nickel-steel, made to government requirements in bore and groove measurements, and is capable of firing an unusually large number of shots before losing its accuracy. Although the rifle is heavy, weighing 11 pounds, this weight is distributed so as not to be uncomfortable in any firing position.

**FIND GLASS "MOUNTAIN" AFTER
528 FIRE HAD RAZED PLANT**

After fire had completely destroyed extensive glass works at Utica, Ohio, there was discovered an interesting rocklike formation. A huge vat of molten glass had boiled over during the fire, and running down the sides had formed a miniature "mountain of volcanic lava." When cooled, it was found to be a peculiarly shaped mound, a delicate sea green in

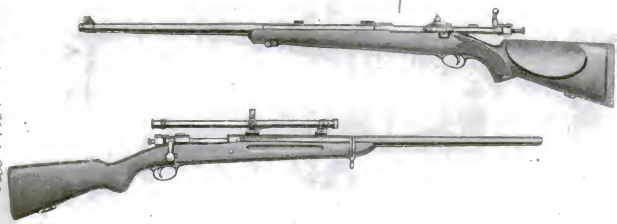


The Miniature "Mountain" Shown Above was Formed during a Fire at a Glass Plant in Ohio, When a Huge Vat of Molten Glass Boiled Over

**506 NEW SUPERACCURATE RIFLES
OF U. S. STANDARD CALIBER**

For special use by snipers, on account of its extreme accuracy, a new rifle of standard U. S. government caliber, is now being manufactured. There are two types of the new rifle, one for fitting to a remodeled standard stock, and the other to a handmade stock to suit any individ-

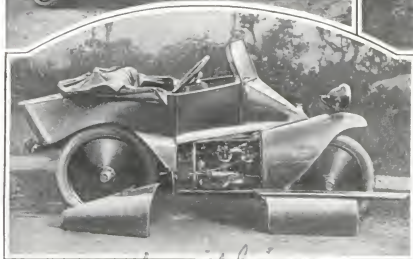
color. The glass breaks off easily, much to the pleasure of souvenir hunters.
Harley Sims, Howard Ohio.



Two Views of the New United States Caliber Sniper's Rifle Barrel, the Lower One Showing It Fitted to a Remodeled Service Stock with a Sighting Telescope, and the Upper One Attached to a Handmade Stock, with Fittings to Suit Any Purchaser's Requirements: The Breech is Shown Open in the Latter Case

Prices from: Shooting Promotion
Division

Winchester Repeating Arms Co.
New Haven Conn.



The Illustration Above and to the Left Gives a Good Idea of the Mobility of the Car. By Noting the Lines Made in the Roadway It is Seen That the Car is Able to Turn Completely Around with the Third Wheel Remaining Practically in a Fixed Position. Above: Rear View of the Car. Showing Luggage Compartment, Collapsible Top, and Controlling Mechanism. Below, Left: Removable Section Taken Out, Showing the Easily Accessible Motor, a 10-Horsepower Two-Cylinder Design

LIGHT AUTO IS EVOLVED FROM MOTORCYCLE AND SIDECAR

Starting where the motorcycle and sidecar "left off," an English inventor has built an attractive light car which combines the comfort of the auto with the economy and mobility of the sidecar. The usual three wheels are retained and the chassis frame is made up of a series of triangles. The body is modeled on that of a runabout, with slanting radiator hood, windshield, wide cushioned seat, collapsible top, and rear compartment for luggage or extra tires. The controlling mechanism resembles that of the larger machine, and the engine, a 10-horsepower two-cylinder design, is water-cooled like that of larger cars. A removable strip in the body below the driving wheel makes the engine easily accessible.

stationary with a spindle that can be adjusted by means of a large graduated wheel. It has a range of 8 inches between the anvils, and a height of 3 1/4 inches between the anvils and the work tables that are clamped to the bed of the



Above: Measuring Machine Shown Adjusted for Small Work. Right: The Machine in Operation on Large Work



BENCH MEASURING MACHINE OF EXTREME PRECISION

For making measurements accurately to .0001 inch, a micrometer, in the form of a bench measuring machine, is now on the market. It is composed of two measuring heads, one adjustable with a stationary spindle and anvil, and the other

machine when required for large work. For supporting small work, a channeled bar is inserted in a hole in the adjustable measuring head under its spindle and anvil. This bar extends across any opening between the two measuring heads and supports a standard cylindrical inch gauge that is accurate within a limit of .000005 inch.

Cml. Wheeler & Harsh
Suadalufe. Zacatecas, Mexico.

848

POPULAR MECHANICS



Conical Concrete Silos for the Storage of Corn in Mexico: They are Well Built, of Concrete Made with the Best Portland Cement, and Preserve the Corn for Use in Lean Seasons

CONCRETE SILOS IN MEXICO FOR STORAGE OF CORN

To prevent depredation by rats, and other rodents, silos for the storage of corn in Mexico are made of concrete. They are conical in shape, well finished and constructed, and of considerable height and capacity. Their purpose is to store corn in seasons of plenty for use in lean seasons, that might cause famine. In some places several are built near together in rows.



The Projecting Columns Shown Above are Strongly Illuminated at Night So That Passers-By need Not Fear Loiterers Who might be Hiding near the Building

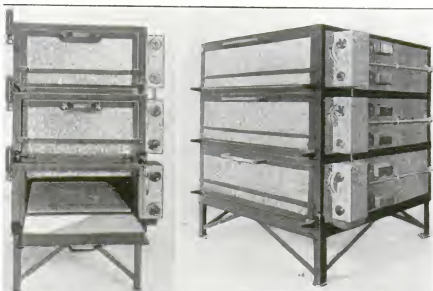
COMPANY CHASES "BOGY-MAN" FROM BUILDING

So that passers-by need not fear loiterers who might be hiding in the dark shadows made by the projecting columns of its building, a Detroit company sets a good example by lighting these sections each night. By using standard 200-watt lamps and powerful reflectors, the company is able to concentrate a strong light near the sidewalk. The projectors are set in the building 24 feet above the street.

national X-Ray Reflector Co.
418
ELECTRICAL BAKE OVENS MADE IN SECTIONS

Electrical bake ovens are now being manufactured in sections having, at the top and bottom, inclosed heating units which are so distributed as to give a uniform temperature throughout the baking chamber. The sections are built with capacities of 20 and 60 loaves. This new oven makes possible the purchase of as many sections as are needed; for instance, one for the small bakery, two for the larger shop, etc., and in addition the baker is enabled to increase his equipment in proportion to the expansion of his business by merely buying more sections. Each section is equipped with motor-operated snap

switches, a thermometer, and a thermostat for controlling the temperature.



At the Left is Seen an Electrical Bake Oven Having Three 20-Loaf Sections, Mounted One above the Other, While at the Right is Shown an Oven Consisting of Three 60-Loaf Sections

ELECTRICAL MACHINE CAN MAKE ELEVEN MILLION CODES

By H. H. DUNN, 2722 *France St.*
Berkeley, Calif.

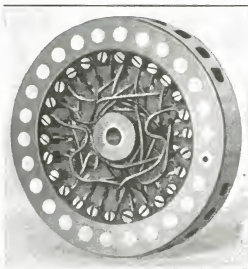
IT is written in the chronicles of the Civil War that a code message sent by General Grant to Washington has not yet been deciphered. It is known that in the naval engagement off Jutland, in the World War, the code system was discarded after the first hour of use, and some of the code messages were not deciphered for three days after that first hour. In a recent sham battle off San Diego, the records show that it was nearly six months before some of the code messages sent during this naval "engagement" were reduced to understandable English. That is to say, the code as used in written messages during the war of 60 years ago, and the radio codes used during the late war, were not always, nor uniformly, successful.

For this reason, unusual interest attaches to patents recently issued to a Californian, Edward H. Hebern, of Oakland, for a code-sending and receiving machine, for use with either wire or wireless. This machine sends its messages in a code which is capable of 11,881,376 changes, so that it is possible, by working all of these alterations, to obtain and use on this one machine a practically unlimited number of different codes, the key to any one of which is not the key to any other one. The operator of the sending machine writes his messages in plain English, on the keyboard, just as he would write them on the typewriter. By means of a "master wheel," or "key wheel," these messages are sent, by wire or radio, in a code which this wheel writes.

The receiving machine at the other end—sending and receiving apparatus being combined into one machine smaller than a typewriter—receives the wire or wireless messages in code, and presents them to the operator at that end spelled out on an illuminated keyboard, in plain English again. That is, the message is written into the machine, put into code by the machine, transmitted in code, decoded by the receiving machine, and presented to the receiving operator as originally writ-

ten by the sender without possibility of error. If any machine yet devised can think, this one does, or seems so to do. In appearance, it is not unlike one of the early phonographs, records for which were made on wax cylinders, instead of on flat disks. There is, however, no wax cylinder, composition disk, or other recording attachment. Whatever is sent into the machine is buried within it, as soon as the master wheel has coded the message and sent it on its way along the wires or through the ether.

The secret of the invention is in the master wheel, a small spool, not unlike that on which typewriter ribbons are wound, containing 26 apertures in either side, and a similar number in the rim, the whole wheel being about 3 inches in diameter. Each letter is wired in combination with other letters, the whole machine being electrically operated, and it is in this wiring that the secret of the instrument lies. The receiving operator has racked in front of him any number of these spools or wheels, wired to correspond to a similar number of other wheels. Letters common to two spools are first sent; by



The Key, or "Master Wheel," of the New Coding Machine, and Its Intricate Electrical Wiring, in Which Lies the Secret of the Instrument

these the receiving operator knows which wheel is being used to send, and drops into the machine the similarly wired spool from his rack. Only two spools similarly wired will work together.

At a demonstration in the inventor's office, the sending operator wrote the word "N-O-O-N" on his keyboard. Ten different wheels, selected at random from a rack full of them, sent this out over a wire in ten different combinations of letters, as follows: VYDT, EFHW, LJSM, RQZK, YZFD, GCKG, MEZE, HKMZ, BCFH, and UFEE. It will be noticed that in only one of these code sendings does the same letter appear twice in such position as to indicate a comparison with any two letters in the original word. That is in the combination GCKG, when the two G's take the place of the two N's, yet the two O's are represented by two different letters, C and K.

When the corresponding key wheel had been inserted in the receiving instrument and the message came over the wire, the letters "N-O-O-N" flashed up from the

is useless; the wheel without the machine is nothing but a little metal bobbin.

"To solve any one message sent out between any two of these machines, and plucked from the air or the wires by ordinary wireless or wire instruments, would require exactly 11,881,376 experiments, and it would require all the time of a staff of code experts for 100 years to make these experiments. This statement, which is exactly true, will give you some idea of the work of attempting to decode one message, even one word out of a message, without the aid of the receiving instrument."

Representatives of five governments have been in Oakland within the past six months, studying the machine, but the inventor will transfer it

to the United States government alone, though he is working on another type of machine for the transmission and translation of ordinary commercial codes, to facilitate the sending and receiving of business and personal messages, either by land wires, cable, or radio.

The development of this wonder-work-



The Inventor is Shown Here with His Code-Sending and Receiving Machine, Which is Equipped to Operate Either by Wire or by Radio. The Machine, with the Proper "Key Wheel" Inserted, Translates the Coded Message from Any Similar Machine Immediately on Receipt. The Typewriter, to the Left, Gives an Idea of the Size of the Coding Machine

receiving board, where each letter appears on a small opaque glass, light throwing each letter into prominence as the word is decoded. In order that there may be no telltale record in the machine, the operator may copy the English words as they appear, or, if necessary, both sender and receiver may retain the text of the message in their minds. The complications contained in one of these messages may possibly be understood a little better when it is said that agents of the United States secret service worked 15 months over one code message, printed from the little wheel without being able to decipher it.

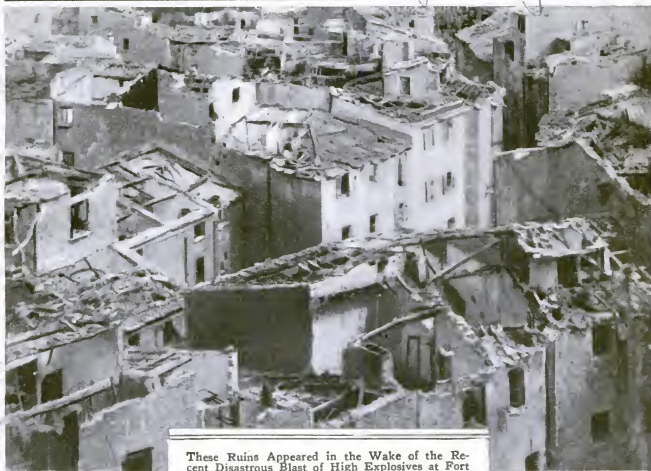
The instrument, for which a name has not been chosen, works on the principle of the electric typewriter, but all it borrows from this machine is the application of the electric current. "It is merely," says the inventor, "the application of the electric current in certain combinations, which causes the machine at the receiving end to reproduce in understandable words an apparently meaningless, yet systematic, jumble of words sent out by the operator of the sending machine. Neither the sending nor the receiving operator knows the letters that are going through the air; that is the secret of the machine. the secret, rather of the two little, electrically synchronized wheels, a dozen of which can be carried in a man's coat pocket. The machine without the wheel



The Coding Machine Complete: The "Key Wheel" is Seen Clamped on Top. Below Is the Receiving Apparatus, Consisting of the Letters of the Alphabet on Opaque Glass, Illuminated from Behind, and at the Bottom the Sending Keys

ing machine has taken only a comparatively short time. The first one, completed about four years ago, was 6 feet high by 3 feet square, while the type now described is smaller than the ordinary typewriter, being about 8 by 10 by 6 inches in dimensions. It also weighs less, and fits in a carrying case.

591 International Newsreel Corp
126 William St.
Hartford City
GREAT HAVOC WROUGHT BY EXPLOSION IN ITALY



These Ruins Appeared in the Wake of the Recent Disastrous Blast of High Explosives at Fort Falconara, in Italy. The Tremendous Force of the Explosion Wrecked Buildings for Miles Around, Killing 200 Persons and Injuring 700 More. Above are Seen Some of the Ruined Dwellings, the Roofs of Which were Literally Blown Off and the Walls, in Many Cases, Torn Down. The Picture Below Shows a Few of the Great Number of Small Boats That were Thrown Up on Shore by the Terrible Blast



Campbell & Smith, Victrola, reborn, d. ind.

Com. C.A. Briggs, 1521 Oak St. N.W.

852

POPULAR MECHANICS

Washington

CONVENIENT KITCHEN CABINET HAS NEW FEATURES

UNDISTORTED SOUNDS GIVEN BY NEW PHONE RECEIVER

An improved kitchen cabinet embodies many practical suggestions for the con-

The outstanding problem in conveying human speech appears to be in the receiver which converts electrical impulses back into sound waves.



This Kitchen Cabinet Has a Disappearing Ironing Board, a Built-In Alarm Clock, a Double Socket for Electric Light and Iron, a Coffee Mill, and Numerous Other Conveniences

venience of the housekeeper. A desk section holds cookbooks and account books for ready reference, and a built-in alarm clock not only tells the hour of the day but serves as a reminder when the roast or baking is done. A double socket at the top provides for light and an electric iron at the same time, while a disappearing ironing board is always at hand.

By far the greatest part of the distortion is imposed on the sound by the diaphragm generally used for reproducing it. This gives added interest to a new form of diaphragm which has been devised for converting electrical impulses into sound. The arrangement consists of two flat coils, placed close together, and through which a direct current is passed to produce a radial magnetic field between them. In the magnetic field in the disklike space between the coils is placed a nonmagnetic-metal diaphragm. The vibrating electric current used to set up the sound is superposed on the continuous current through the coils. This induces currents in the diaphragm which, reacting with the magnetic field, set up vibrations which produce the sound.

It is reported that this device gives very pure notes; and it may be that this scheme can be developed for general use in reproducing with great exactness speech, music, and other sounds conveyed by wire or radiophone.

TRAINMEN'S SIGNAL LANTERN CARRIES OIL IN HANDLE

A signal lantern recently invented utilizes the handle of the lantern as an oil reservoir. The wick is fed from a small cylindrical receptacle which in turn communicates with the tubular handle. One of the principal objects of this arrangement is to produce a signal light for trainmen which will cast but a small amount of shadow from the bottom of the lantern, for which reason the base of the lantern also is made small and open.



ARMY DIRIGIBLE DESTROYED AFTER COAST TRIP

After completing a trip from the east coast to the Pacific without mishap, the army dirigible airship "C-2" was totally destroyed by fire at Brooks Field, San Antonio, Tex., while maneuvering to get out of the hangar. There were no serious injuries, although a number of the men had narrow escapes, especially several officers who were in the car of the airship at the time the fire broke out. While longer sustained flights have been made by other dirigibles, the transcontinental performance of the "C-2" is particularly noteworthy in America, inasmuch as it involved the hazardous crossing of the Rocky Mountains. The ship is reported to have cost 270,000 dollars.

University of Iowa, Iowa City, Iowa.
Arrested by C. A. Heuleth.

Mr. John C. Frosted
Heuleth Minn.
no street address given

H.M. Jones 10/18/22 Page 1

322 Ave, W. 41st



Lieutenant Maughan and the Curtiss Biplane in Which He Won the Pulitzer Race This Year with an Average Speed of 206 Miles an Hour: Two Days Later He was Timed at the Rate of 248.5 Miles an Hour

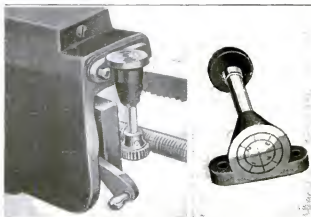
ARMY BIPLANE WINS AIR RACE WITH RECORD SPEED

Traveling at the astonishing rate of 248.5 miles an hour over a measured course of one kilometer (.62 miles), Lieut. R. L. Maughan, a United States Army pilot, established an unofficial new world's airplane speed record on October 16, at Detroit. In order to show that this pace could be maintained, he continued his flight, which was timed at 232.2 miles an hour for four laps, while his average for eight laps was at the rate of 229 miles an hour. This record was made in the same plane with which Lieutenant Maughan won the Pulitzer trophy race two days previously with an average speed of 206 miles an hour. The machine is a Curtiss army biplane driven by a 400-horsepower Curtiss motor.

DEVICE FOR THREAD CUTTING ATTACHABLE TO ANY LATHE

A device to facilitate thread cutting on engine lathes consists of a cast-iron bracket supporting a brass sleeve and dial, a steel shaft, and a brass worm gear suited to the pitch of the lead screw of the

lathe to which it is attached. All the operator has to do is to close the nut on the lead screw at the proper time, as shown by the dial, and then open it when the tool has traveled the required distance. The lathe runs continuously, and there is no necessity of stopping and reversing it at the completion of each cut. The device is attachable to the carriage



Left: Threading Dial Shown Attached to the Carriage of a Lathe. Right: Enlarged View of the Attachment, Showing the Dial That Guides the Operator

of any lathe, and can be used for internal or external, odd or even, right or left threads, regardless of length or diameter.

*Law. Times 10/17/22
 20 Colfax St., Yonkers, N.Y.*

4972

Mr. James McIntyre
upstartado 216,

FANTASTIC ROCK FORMATION IN THE VAULTED

Tampico, Tamps, Mexico



Entrance, 70 Feet High and 150 Feet Wide, to the Mammoth Cavern, 30 Miles from Cuernavaca, in Mexico, near an Indian Hamlet on the Foothills of a High Mountain Range



Close-Up of Part of the Wall of One of the Cavern Chambers Composed of a Solid Mass of Stalactites Depending from the Roof and Giving It a Curtainlike Appearance



More Distant View of the Stalactite Formation That Has the Appearance of a Huge Hanging Curtain: It is So High That It Dwarfs the Crowd of Visitors beside It

CHAMBERS OF A MAMMOTH CAVERN IN MEXICO



One of the Largest of the Chambers in the Depths of the Cavern, Notable for the High Monolith, at the Base of Which Three Men are Seen: It is Called the Lighthouse



Another of the Chambers in the Mammoth Cavern: On Top of the Pile of Stalagmitic Incrustations of Lime Is a Seat. Hence This has been Called the Throne Room



The Chamber Nearest to the Entrance of the Cavern is Called the Goat Room, Because the Indians Saw in the Rocky Pile Dominating It the Semblance of a Goat

Fields

512

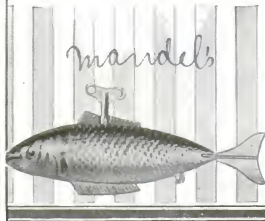
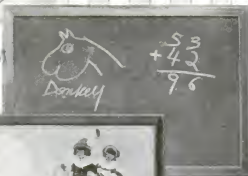
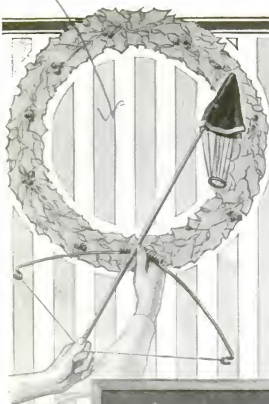
INGENIOUS TOYS FOR

BY STRATFORD

AMONG the bewildering number of Christmas toys displayed this year are many which engage the attention of the grown-up as well as that of the boy or girl. A toy loom recently brought out is a good example. This seemingly very practical device, modeled on the regular factory loom, weaves a fabric 8 inches wide and is suitable for an almost endless variety of patterns. The base measures 15 by 10½ inches, and the height is 13 inches.

It is a four-treadle type, meaning that there are four controlling levers and four main sets of interweaving heddles, which arrangement, by the way, permits a greater variety of design than would be possible with a loom of fewer controls. The yard beam holding the material to be woven is easily detachable by means of a screw and nut at each end, as is the cloth beam which receives the finished product. The whole device is carefully built of steel and finished in black and blue enamel. Complete instruction books are, of course, furnished with each outfit.

Another evidence of careful construction is seen in the designing of miniature steam autos. There are both trucks and touring cars, with the boiler in each case under the radiator hood and heated by two small wicks fed from a tank of denatured alcohol. The autos, controlled by a lever in imitation of the regular gear shift, run backward or forward, and the driving



An Interesting Toy Displayed This Year Is the Small Parachute Shown at the Top. Beneath Is a Blackboard Which Has an Attractive Painting on Its Opposite Face, as Shown Immediately Below. The Loom Pictured to the Left Weaves a Number of Useful Articles and is Easily Run. The Fish Shown to the Right Swims in a Realistic Manner

Director
Mfg. Co.
71 rephort. d. ll.

Mandel's

Mandel's

CHRISTMAS SHOPPERS

F. CORBETT

wheels, can be locked to any desired curve.

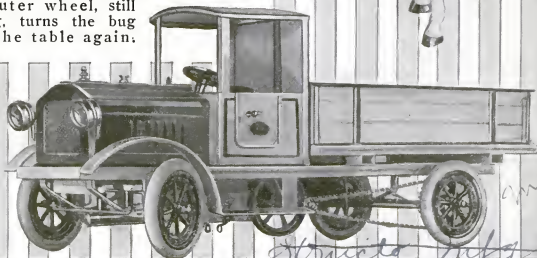
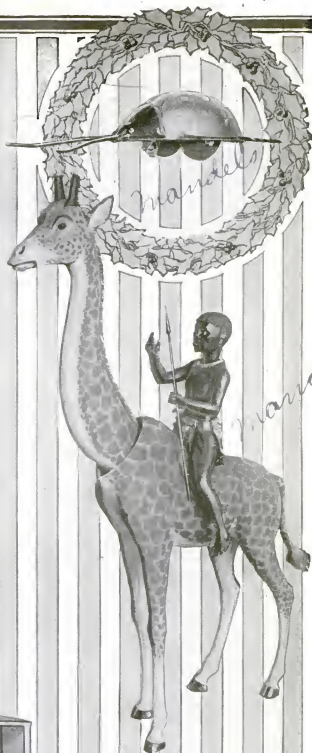
There are again the usual number of elephants that move their trunks and other animals that move one part of their body or another. A large giraffe has on its back a negro huntsman holding a spear; both move their heads and mouths.

For the nursery there have been made blackboards which have an attractive picture painted on one side, so that after being used, the unsightly blackboard can be turned to the wall. The pictures, which are framed, illustrate scenes from popular fables.

A small parachute that is shot into the air with a bow and arrow is one of the many devices for outdoor sport. The bow is of steel, and the arrow of light wood, so that a high-altitude jump is possible.

Other indoor toys present many evidences of ingeniousness. A fish that swims under water, wagging its tail and vibrating in a realistic manner, is one. A lady bug that "sees" is another. This mechanical insect rolls along a table until its feelers run off the edge, whereupon it very promptly turns and sets off in another direction. It seems uncanny when first seen. The trick is worked by means of a weight and lever suspended in the forepart of the device.

When the feeler goes over the edge it unbalances the weight so that the lever catches the inner of the two wheels. The outer wheel, still moving, turns the bug onto the table again.



One of the Cleverest Toys Is the Bug at the Top, Which Automatically Shies from the Edge of a Table. Below Is a Large Giraffe Which Moves Its Head and Mouth While the Negro Huntsman Appears to be Shouting Abuse. The Auto Shown Here is Run by Steam Generated with Denatured Alcohol. The Wicks can be Seen under the Radiator

9/22/22

At present

858

POPULAR MECHANICS

+ Meserole Inc

SOLDERING FLUX IN STICK

485 OFFERS ADVANTAGES

A new soldering flux just placed on the market, is made in convenient stick form



This Soldering Stick is Incased in Soft Lead, Which can be Peeled Off in Strips as the Stick Wears Down

and has some other advantages. The container is of soft lead so made that it can be peeled off in strips as the stick wears down, exposing the fresh flux which is rubbed over the parts to be soldered. It is claimed always to remain fresh and firm, even in hot weather, to be practically noncorrosive, and to produce no fumes injurious to the health of the worker.

635 CRUDE-OIL AIRPLANE ENGINE
DEVELOPED IN ENGLAND

It is reported that a manufacturing concern, in conjunction with the British air ministry, has produced a promising type of crude-oil air engine. For the present, details of its construction are withheld, but it is understood to be a six-cylinder motor developing from 750 to 1,000 horsepower. It is known that, at the royal air-craft establishment, experiments have been in progress for a long time on engines of the Diesel type using shale oil, and also on the solid injection of a fuel containing 95 per cent alcohol. The advantages of these fuels are their greater safety from fire, and their economy of running cost.

500 POWERFUL LOCOMOTIVES USED
IN SWITZERLAND

Switzerland possesses powerful locomotives of the latest types, one of these being electrically driven, and another having a combination of gasoline and electric propulsion. The first is used on narrow-gauge roads, while the other is made for standard-width rails. The narrow-gauge



One of Switzerland's Powerful Locomotives, Which Has a Combination of Gasoline and Electric Propulsion and Which was Designed for Standard-Gauge Roads: Note How the Engine and the Coach are Combined



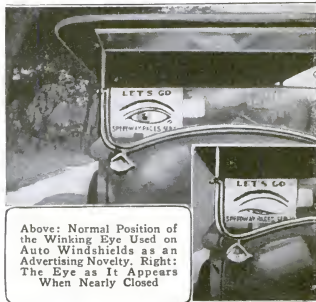
One of the Powerful Electric Locomotives Which have Recently been Put in Operation over the Rhaetian Railway, in Switzerland, Shown with Its Train of Cars, in the Thusia District of the Grisons Canton: These Engines are Declared to Be the Most Efficient Ever Built for Narrow-Gauge Railroads

engine, which weighs only 65 tons, draws a train weighing 200 tons up a 3.5-per-cent grade. Its speed is approximately 19 miles an hour. Up a 4.5-per-cent incline, which is the maximum grade of the Rhaetian Railway in that country, this efficient engine will haul a load of 150 tons. The locomotive, propelled by a combination of gasoline and electricity, is equipped with a Diesel motor which drives an electric generator. Sufficient power is furnished by the generator to attain a speed of 43 miles an hour under ordinary conditions.

WINKING EYE ON WINDSHIELD AS ADVERTISING NOVELTY

A large winking eye placed on automobile windshields is being used as an advertising novelty in Missouri. The poster in its usual position depicts a large wide-open eye, above and below which is printed the advertising matter. The eyelid is hinged at one end of the eye while the other end is held raised by a rubber

band. By means of a string attached to the rubber band the lid can be pulled down by the occupant of the automobile, and as soon as the pull is released, the rubber band draws it back into normal position.



Above: Normal Position of the Winking Eye Used on Auto Windshields as an Advertising Novelty. Right: The Eye as It Appears When Nearly Closed

The Huntzinger Adv. Co. Kansas City, Mo.

La Société Suisse pour la Construction de locomotives et de machines, Winterthur, Switzerland.

459 George R. Ladd Co
First National Bank Bldg
Pittsburgh Pa.



Left: Blast-Furnace Plant for Making Pig Iron. Center: Partly Completed Steam-Generating Plant and Power Station. Right: Powdered-Coal Preparation Plant, at the Works of a Detroit Automobile-Manufacturing Company

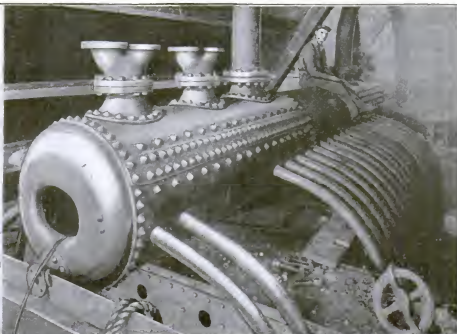
LARGEST POWER BOILERS NOW IN OPERATION



This Picture, Showing Eight Automobiles Parked in the Furnace of One Boiler, Gives an Idea of the Unusual Proportions of the Boiler

Four of the contemplated 12 largest power boilers ever constructed, have already been placed in successful operation at a Detroit industrial power plant. These gigantic boilers having a normal rating of 2,650 horsepower, have been operated at more than four times that rating and have developed, in consequence, over 10,000 horsepower each.

The boilers are of the five-drum type, having four steam and water drums, 5 feet in diameter by 26 feet long, with shell plates $1\frac{1}{8}$ inch thick, and one top steam-collecting drum, 3 feet in diameter by 26 feet long. Interconnecting the drums is a



Left: Diagram Illustrating Toggle-Suspension Hangers, Which Permit a Total Play of $1\frac{1}{2}$ Inches to Take Care of Drum Expansion. Right: Immense Steam-Collecting Drum of Boiler, Rated at 2,650 Horsepower

nest of $3\frac{1}{4}$ -inch diameter tubing, which if placed end to end would be nearly six miles long. These tubes constitute most of the 26,470 square feet of heating surface of each boiler, which is the total amount provided, not including the superheater and economizer. Steam is generated at 240 pounds per square inch, boiler pressure, and is superheated to 200° Fahrenheit.

The furnace is approximately 23 feet by 24 feet inside and about 55 feet high above the ash pits, which allows about 5 cubic feet of combustion space per normal rated horsepower, after the proper deductions have been made. The floor space occupied by each unit is only 29 by 31 feet. Mounted over each boiler is a brick-lined steel stack, 11 feet in inside diameter, with the top reaching more than 300 feet above the ash-floor level. The complete structure of the boiler, superheater, and setting is supported entirely on the building steel, the total weight of each unit—exclusive of the stack—being approximately 1,100 tons. Not including the steel for the building, superheaters, or stack, the material in each boiler required 28 railroad cars for transportation.

It is intended to use blast-furnace gas as the main fuel, supplemented by pulverized coal, for which purpose an up-to-date powdered-coal preparation plant is provided.

At one time four fuels—powdered coal, blast-furnace gas, by-product tar, and fuel oil—were burned, and this is believed to be the only instance where so many fuels of such different characteristics, have been used simultaneously under a boiler.

An interesting feature of the construction is the method of suspension for the drums, which are carried on hangers that permit longitudinal and transverse movement, due to the elongation of the drums and the increase in center-to-center dimensions of the supports, without any

appreciable expansion strains. The first four of the proposed 12 boilers to be installed, have been in operation for about 18 months. The second series of four boilers have been contracted for and are now in process of manufacture. The last four will be added later.

The completed plant of 12 boilers, when operated at 400-per-cent rating, will



A Partial View of the Nest of Tubes Which Constitutes Most of the 26,470 Square Feet of Heating Surface of the World's Largest Boiler: If All the $3\frac{1}{4}$ -Inch Tubing in This Boiler were Placed End to End, It would Form a Tube Nearly Six Miles Long

be capable of developing approximately 130,000 boiler horsepower.

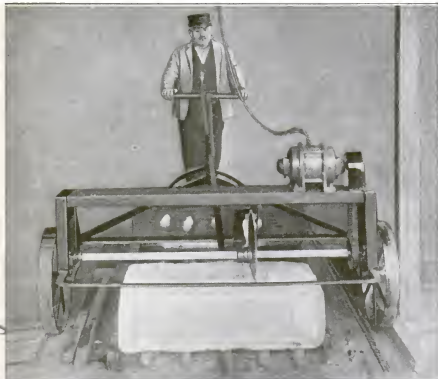
623
A drydock now under construction at Havre, when completed, will be the largest in France, and one of the largest in the world. It is to be 1,020 feet long, with 111 feet width of entrance, and will accommodate vessels with a draft up to 44 feet. The dock will be emptied in four hours by eight electrically driven centrifugal pumps, each with a capacity of 6,000 cubic feet per minute.

nautilus 9/30/22

Dr. George A. Shies
Snapp Laundry,

862
483 *W. Winchester Va.* **POPULAR MECHANICS**
WASTEFUL ICE PICK REPLACED
BY POWER-OPERATED SAW

An electrically driven saw has been developed to meet the demand for a quick



This Motor-Driven Saw Cuts Only About Halfway through the Block of Ice, Leaving It as a Unit, Yet Divided into Cakes of Any Desired Size, Thereby Reducing the Melting Loss during Delivery

and efficient method of cutting ice into pieces for retail trade. A circular saw slides on a square axle and is adjusted to the desired size of cake, by the operator with a hand lever. The saw cuts little more than halfway through the cake, leaving the block as a unit until ready to be taken from the delivery wagon, when a pick inserted in the saw cut easily removes the desired amount. Keeping the block as a unit, reduces the melting loss during delivery. The outfit can cut 10 to 15 tons an hour.

Dr. J. C. Carl
St. Pauli market, Hamburg
COKE COOLED IN CLOSED TANK
BY NONCOMBUSTIBLE GAS

According to a new process for cooling coke, devised at a Swiss engine factory, the glowing coke is transferred from the retort to a closed tank, through which a stream of gases not supporting combustion is passed. The heated gases then deliver their heat to a steam boiler directly connected to the tank, and are recirculated through the coke until it is cool enough so that it will not ignite when exposed to the atmosphere. This method is said to involve little expense,

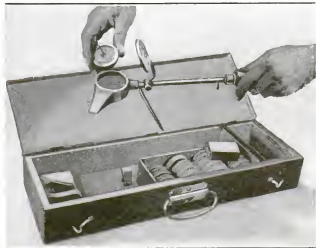
and to improve the quality of the coke as well as utilize considerable heat which would otherwise be lost. One ton of coke cooled in this manner is reported to yield sufficient heat to generate steam equivalent to over 25 boiler horsepower.

SOLDERING IRON
CHEMICALLY

62 *HEATED*

A small soldering iron just introduced into this country from Germany, is supplied with heat evolved from the reaction of a mixture of chemicals. A tin box holding a measured quantity sufficient to last 10 minutes, is placed in a cavity cast in the head of the iron, and the mixture is ignited by means of a special match inserted through a hole in the lid. The resulting reaction produces an intense white glow, sufficient to heat the iron ready for use in seven seconds. It is

not expected to replace the iron and torch used by mechanics, but to be a handy device for workmen who have to make quick repairs. The idea is on the order of the thermit-welding process, although it is understood to have an improvement in that the proportion of chemicals to produce a given amount of heat has been determined. It is planned



This Soldering Iron is Supplied with Heat from the Reaction of Chemicals

to extend the application of this principle to many other interesting purposes.

921 Southern Railway
Washington, D. C.
International Sales Co

SALVAGING A U-BOAT TO SINK IT

BY EDWARD G. MAXWELL

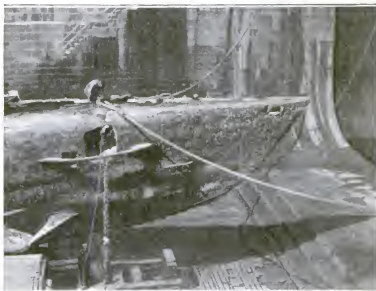
Box 1057, Norfolk Va.



The United States Ship "Falcon," the Navy's Salvage Ship, Which is Equipped with the Most Modern Devices and is Manned by a Crew of Experts, Selected from the Whole Personnel of the Navy

THOUGH equipped with the most modern devices for raising sunken vessels and manned by a crew in which are specialists drafted from the whole navy, the U. S. S. "Falcon," the navy's salvage ship, was two months in floating the ex-German submarine "U-111" which once attempted to cheat the executioner. The teredo, aquatic auger of southern waters, was to blame.

The "U-111" was brought to the United States, following the



Above: Barnacle-Covered Prow of the Ex-German Submarine "U-111," as It Lay in Drydock. Left: The Submarine in Drydock at the Norfolk Navy Yard, Where It Was Completely Dismantled to Discover Its Secrets



armistice, with a number of other war vessels which had flown the kaiser's flag until turned over to the allies at Scapa Flow. It was taken to the Norfolk Navy Yard, where the men who design American fighting craft pried around inside it to find out what made the German undersea fleet the terror of the world. In their quest for structural secrets they removed all

pipe and with wooden plugs stopped up the holes where the pipe went through



Commander of the United States Ship "Falcon,"
Standing on the Deck beside the Conning Tower
of the Ex-German Submarine "U-111"

the hull. There were 80 outlets, altogether.

Nearly two years ago the "U-111," which was a commerce raider during the war, was towed out from Norfolk in company with the other ex-German vessels, to be sunk in deep water in accordance with the treaty terms. Its companions were destroyed, as scheduled, by bombs dropped from naval airplanes, but the "U-111," a stubborn craft, sank in 40 feet of water while being towed to sea.

The navy knew that the grave into which the submarine had cast itself was not deep enough to satisfy the treaty provisions, but the "Falcon" was busy on other assignments, and it was nearly 18 months before the salvage ship, a converted minesweeper, was ordered to raise the last of the ex-Germans. The sinking of the submarine in shallow water, it was thought, was due to the slipping of one of the wooden plugs, and the "Falcon" was expected to meet no difficulty in again plugging the hole and pumping the craft out so that it would rise. The existence of the teredo was ignored in these calculations.

But during the time the "U-111" had lain on the bottom, the teredo, which is a sort of shellfish with an unappeasable

appetite for wood, had cut into sawdust, to the last plug, the 80 stoppers put in while the submarine was in drydock. The "Falcon's" crew, among whom are 18 skilled divers, had to patch up something which was far from being a boat and not so far from being a sieve. When the Navy Department learned the true conditions, all agreed that the "Falcon" had done well in floating the submarine in eight weeks.

On the surface again, the "U-111" enjoyed but a short life. As soon as the patches put in under water by the divers were strengthened to prevent a recurrence of the first accident, the "Falcon" towed it offshore and sank it, with a mine, out beyond the 200-fathom line.

636

IMPORTS INDICATE GROWTH OF SOY-BEAN INDUSTRY

The rapid growth of the soy-bean industry is shown by the increase in the value of soy-bean oil imports which was \$635,882 in 1913, and \$25,280,085 in 1920. In the past, most of the soy-bean oil imported has been used in the soap industry, but it can be used to replace, in part, linseed oil in the manufacture of paint, and it is regarded by many as superior to linseed oil for mixing enamels.

471

LUMINOUS DEVICE AIDS NIGHT LANDING OF AIRPLANES

An English firm has developed an automatic ground-wind indicator for use on emergency and other landing fields where there are no attendants. It is built in the shape of the letter "T" in a form approximating that internationally agreed upon to indicate landing zones, and has a rudder causing it to head into the wind. The three vanes are mounted so as to receive upon their upper surfaces light projected through the lenses fitted around the light source, which is derived from a gas supply sufficient to last six months to a year.



This Landing-Field Indicator can be Seen from Normal Flight Heights, at a Range of Five Miles by Day and 12 Miles at Night

Accumulators & Gas Co. Ltd.
Beacon Works, Brentford,
England.

COMMENT AND REVIEW

[These pages were printed October 25, 1922.]

THE 192-foot Army dirigible, the "C-2," which, starting at Langley Field, Va., flew to San Francisco, and returning had reached San Antonio, Tex., was destroyed by fire as it was about to make an exhibition flight. The ship is a complete wreck, with no salvage whatever. As in some other similar disasters, there is more or less doubt as to the exact initial cause, though none whatever as to the result.

Another Dirigible Disaster

It would appear that on taking the dirigible from its hangar the wind proved to be stronger than expected, and an attempt was made to return it to its housing. In doing so "the fabric to which the windward handling guy was attached pulled loose, another handling guy broke under the sudden pressure, and the third handling guy failed," etc.; in brief the bag was torn, the car broke in two, and in 30 seconds the ship was a mass of flame. Most fortunately none of the 11 passengers was killed, though eight were somewhat injured in the jump of 20 feet to ground.

The event affords one more example of the fact that a dirigible must always be a "plaything of the winds," a strictly fair-weather vehicle. In its earlier days the dirigible, which was an adaptation of the balloon, promised to become the leading type of airship.

For efficiency and dependability the heavier-than-air craft has now so clearly demonstrated its superiority that there seems little excuse for spending any more money or effort on the dirigible type. There remain few, if any, functions of which the dirigible is capable which cannot be performed by planes or captive balloons.



PROBABLY the most outstanding accomplishment at the recent aviation meet at Mt. Clemens, Mich., was the flight of Lieutenant Maughan, a U. S. Army pilot, who broke all world's records by flying at the rate of four miles a minute. This

Four Miles a Minute

means 352 feet, or an ordinary city block, in one second—while you count one, two, three, four! No other human ever traveled so fast and survived to receive the honor so richly deserved. Could this terrific speed be maintained, it would reduce the time between Chicago and New York to two hours 40 minutes. At present such speed cannot be maintained to exceed a very few minutes, which would probably be the life of any engine we have now. What developments may occur in the next few years would be hazardous to predict, though of course there is a limit somewhere to all things made by man.

While the human mind seems obsessed with anything which makes for speed, the practical utility of an excessive rate of travel quickly reaches its limitation. Even the cheaper types of automobiles can on occasion do 100 miles an hour, but 30 or 35 miles is quite sufficient for all ordinary purposes. Excessive speed is too expensive to become common; for instance, there are only a few really fast trains in the world—two in this country—which undertake any considerable distance on regular daily schedule; and even these owe much of their so-called speed to an elimination of the stops made by other trains on the same roads. How many really fast ocean liners? The records made in auto races are impractical in daily service. Without in any way detracting from the glory of accomplishment in breaking world's records—and America holds its full share—the public is more interested in a much less speed which can be depended on under all conditions.

The airplane has accomplished great things when measured by the early efforts of the Wright brothers, but the continuous record of fatalities of which one reads two or three times a week, can only mean that we have much yet to learn in the operation, and probably construction, of planes. These distressing accidents, moreover, are by no means confined to stunt fliers and amateurs, but a majority of them include either fliers in actual Army or Navy service, or pilots with war records; men who have had long and varied experience, and yet who, in spite of all that, come down in fatal crashes of one kind or another. Much has been done, but a lot yet remains to do before flying can hope to become even relatively as safe as speed boats, locomotives, and automobiles. Those who are giving their

efforts and lives to the working out of this problem deserve the greater praise and encouragement, but the layman can be forgiven if it sometimes seems to him, that the progress of safeguarding travel by air since the armistice has been less than he could hope and expect.



ON a recent Sunday, almost within the limits of a single city, eight people were killed in automobiles at four grade crossings of railroads. Almost daily, the papers describe similar accidents in all parts of the country. The annual list grows into hundreds.

Grade-Crossing Accidents

The automobile has become indispensable, and with something like ten million cars in service, it is inevitable that thousands of drivers are either careless, too venturesome, deaf, have poor eyesight, or possess one or more of a score of weaknesses which sooner or later lead to accidents. Familiarity with any danger breeds contempt, and the driving of an automobile is no exception. It is obviously of little use to talk of punishment to drivers who take reckless chances at grade crossings, for sooner or later they are killed and their cars utterly destroyed. Unfortunately they usually carry passengers who have no voice in the control of the car and who also lose their lives, because of somebody's mad desire to cross a railroad track ahead of a train. It might help some if all automobiles were required to come to a full stop before crossing a track, but the observance of the rule would after all have to be practically a voluntary one, for the majority of ungarded crossings are in the country. Railroads have a rule about stopping a train before it crosses another railroad, or passing over a drawbridge, and although there are thousands of trains making such crossings daily, accidents at such points are extremely rare.

In England highways are not permitted to cross a railroad track at grade, and usually are carried overhead. Moreover, it is a trespass for any but employees to walk upon a track, a law which is strictly enforced. The result is, accidents that are constant here, seldom occur there. It would be an incredible hardship to expect our railroads, with their hundreds of thousands of highway crossings at grade, to provide bridges to carry vehicle traffic overhead, but it would seem that each state might set aside a part of the immense revenue it receives annually in license fees from automobile owners to safeguard such crossings, selecting the most dangerous places first, and each year constructing as many as possible.

Cement has now lessened the cost and difficulty of such construction, and as the years go on, the safeguarding would grow to really worth-while proportions. In the meantime it behooves all who tour in cars to not only "Stop, Look, Listen," but be sure they both see and hear before proceeding.



THE "Association of Tropical Medicine" is a German society devoted to the study of diseases peculiar to the tropics. At its recent convention in Hamburg the announcement was made of the discovery of a cure for sleeping sickness which seems so unusually promising, as to give its possessors the belief that they have the "Key to Africa." It was also urged that Germany should demand the return of its African colonies as the price for giving the cure to the world.

Cure for Sleeping Sickness

Fortunately, this selfish position is not likely to prove very successful, as French and English scientists are also making such good progress along the same line that the secret is not nearly so exclusive as the society believes. The other countries can be depended on to give a discovery of such tremendous importance freely to the world.

H. H. WINDSOR

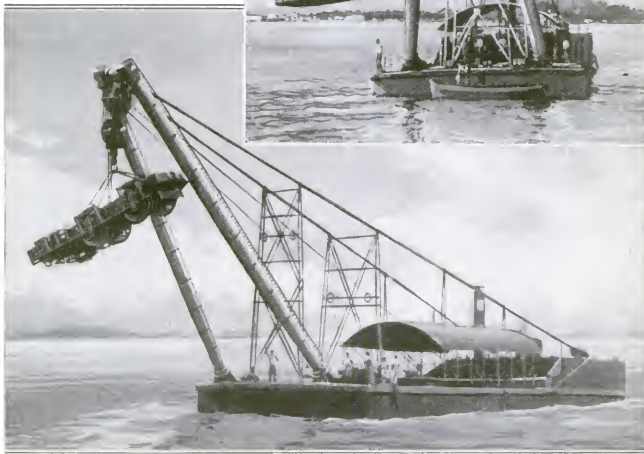


**FLOATING CRANE UNLOADS
EXPORT LOCOMOTIVES**

**TRAVELING LAMP ILLUMINATES
LATHE WORK**

In unloading a shipment of electric locomotives, recently received at Santos, Brazil, from the United States, it was necessary to resort to the use of a floating crane because the ship could not anchor close enough to permit the use of the wharf crane. Although there were some fears about the ability of the crane to handle the heavy loads, the bodies and trucks of the locomotives were successfully transferred from the ship to the wharf some distance away. There the parts were loaded on flat cars and hauled to their destination, where they were reassembled and immediately put in service, apparently none the worse for the long journey. The

A simple device has been designed to provide constant and adequate lighting



The Electrician 9/29/12

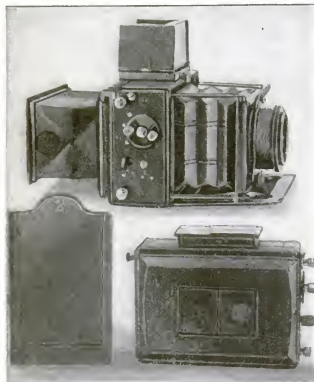
Above: Floating Crane Holding the Crated Body of an Electric Locomotive Just after having Lifted It from the Deck of the Ship. Below: Floating Crane Carrying a Truck of One of the Locomotives to the Wharf

bodies of the locomotives were wrapped in waterproofed paper and securely crated before leaving the factory, and, as they could not be passed through the hatchways, made the sea voyage lashed to the deck of the ship.

for the benefit of mechanics who have to do machine work on a lathe. The lathe carriage is fitted with a spring-controlled reel, from which a flexible twin conductor cord is unwound as the carriage travels toward the tailstock.

**SMALL FOREIGN-MADE CAMERA
POSSESSES ULTRA-SPEED**

830 All the improvements of the large high-speed cameras are incorporated in a small foreign-made camera, which takes a plate



Top: Miniature Ultra-Speed Camera, Shown Ready for Operation. Lower Left: Plate Holder of Camera. Lower Right: Camera Closed

only 2 by 3 inches in size. The miniature outfit is equipped with a focal-plane, or curtain, shutter. This is an unusual departure for a little camera, as most appliances of this kind have the ordinary shutter that opens from the center. Another feature of the tiny product is the incorporation of a ground-glass plate on which the subject may be centered, instead of the common method of using the meter or range finder.

**RADIO LOOP AERIAL USED
IN STEEL TRAIN**

63 Radio messages were received on a loop aerial set up in the steel coaches of a train en route between New York and Chicago, recently. This event marks an epoch in the development of wireless. Hitherto, the reception of all radio messages on speeding trains has been accomplished by the aid of outside aërials, or antennæ, strung along on top of the coaches. The new equipment consisted of a tuned 18-inch loop aerial, three steps of radio-frequency amplification, vacuum-tube detector, and two steps of vacuum-

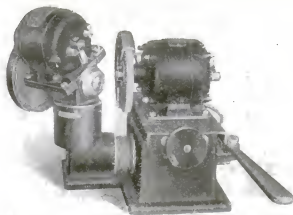
tube frequency amplification. During the trip, an entire 45-minute concert was heard from Newark, N. J., a ship was "picked up" on Lake Superior, and while at a distance of 200 miles from Chicago, the operator successfully tuned in to the Great Lakes Naval Station.

**BRITISH SAILPLANE SOARS
FOR NEARLY TWO HOURS**

62 Captain Raynham remained in the air with his glider for 1 hour 53 minutes in a gliding contest near Lewes, England, on October 17, and he was at times 300 feet above his starting point. He was as much surprised as the spectators, for he had entered the meet with a little monoplane fitted with temporary controls which the duration of the flight taxed his endurance to hold.

Ref. Times 10/18/22 p.3
**VALVE GRINDING IN GARAGES
WITH SPEED AND ACCURACY**

564 Specially useful in garages and service stations is a new valve grinder that, with two individual motors, is entirely self-contained, and occupies a space of only two square feet. A ball-bearing motor drives the grinding wheel at a peripheral speed of 5,300 feet per minute. The other motor drives the work head, and with this combination each valve and seat can be reground in about two minutes. The work head holds the valve firmly, and guides it so that it is ground at the correct



Valve Grinder with an Individual Motor for the Six-Inch Grinding Wheel, and Another for the Work Head, the Whole Occupying a Space of Two Square Feet

angle. The reamer for the valve seat is ground by the machine also to exactly the same angle as the valve, assuring a good running fit. The machine is furnished with one chuck, one reamer attachment, and one truing diamond.

*Fleming Machine Co.
Springfield, Mass.*



SCIENCE BECOMES POLICEMEN'S FIRST AID

By JOHN ANSON FORD

BELIEVING that the work of a policeman is a technical profession and not a "job," and that the proper application of science and education to police problems will effectually prevent "crime waves," the police department of the city of Berkeley, Calif., has made a remarkable record in recent years in crime control and crime prevention. By the establishment

of a police school, by the introduction of such instruments as an especially designed "lie detector," the microscope, and wire-

less telephones, this remarkable group of police officers, under the guidance of Chief August Vollmer, have actually reduced crime percentages in their city during a period when many other growing cities were suffering from "reigns of terror" and ap-



A Prisoner being Tested by the "Lie Detector," Which Records the Variations in Heart Action and Breathing, as the Suspect is Plied with Questions



Graphic Record from Lie Detector: Top Line Represents Breathing, Second Line Blood Pressure, and on the Bottom Line is Indicated the Instant of Asking Each Question. Note the Irregularities in the Lines Which Indicate That Questions 10 and 12 have been Untruthfully Answered

palling increases in murder, burglary, theft cases, and the like.

Chief Vollmer is one of those responsible for the establishment of the state bureau of criminal identification, and is a member of the board of managers. This bureau performs a tremendous service to the law-abiding interests of the state in maintaining "modus-operandi" information files. In accord with conclusions reached after years of study of the subject in Berkeley police circles, Vollmer has been able to confirm and elaborate the interesting theory, known as the modus-operandi system of criminal identification, which is now recognized throughout California. The underlying principle of this theory is that every confirmed criminal unconsciously falls into certain distinctive habits of operation. In other words, every murder, every robbery, or every forgery, done by a confirmed criminal will have certain "trade-marks" which if known and recognized will unmistakably indicate the perpetrator of the offense. As an instance in point, a typical case may be cited. Not long ago the Berkeley police caught a man who had been burglarizing for several months. They were able to fasten 14 crimes upon him because all of the 14 had these characteristics in common: The houses robbed were all homes temporarily unoccupied; the burglar never broke doors or windows, always using a pass key; he confined himself to jewelry and money, and always removed drawers that he searched to a lower front room from which he could keep a close lookout.

Before mention is made of the absorbingly interesting methods employed by this police department, it should be explained that the members of this force are "hand-picked" men. In place of the burly club-swinging individual, regarded a few years ago as typical of the police calling, Chief Vollmer has gathered about him clean-cut, intelligent men, more than half of whom have had some college training.

Some of the work of these men reads like fiction. During the war, for example, a rooming house occupant disappeared. Because he was suspected as a spy it became imperative that he be located. But so little had he been seen on the premises that no description could be obtained of his appearance or habits.

One of the first steps of the men who set out to find him in the name of the law was to carefully sweep the room from which the man had fled, taking all of his belongings with him. These

sweepings were gathered up with the greatest precaution and taken to the police laboratory for examination. Here the microscope, which Chief Vollmer regards as one of the greatest of police aids, was brought into service. One by one the tiny fragments of material in that handful of carpet sweepings was put under the powerful magnifying glass and studied until each had been definitely classified. The task was one requiring the greatest skill and a knowledge of how thousands upon thousands of different substances look under the microscope.

The Berkeley police department maintains a course of study for all of its men, and one of the subjects in which many of the officers specialize is the use of the microscope. When they have finished the course they can identify a hundred different kinds of fabric, human and animal hair, blood from humans and animals, scores of different wood fibers, chemicals and metals in their various forms, and even the particles of dirt that collect under the finger nails (often a most important piece of evidence).

It was such expert knowledge that was brought to bear on the sweepings from the rooming house, and when the analysis had been completed, here is what the investigators deduced: The room had been occupied by a middle-aged man who wore a gray suit and gray felt hat; he wore a beard which was partly gray and was kept neatly trimmed in Van Dyke style; he was a man of neat appearance and of some leisure; his pastime was making excursions into the country on foot, and he might be designated as an amateur botanist.

At first thought it seems almost unbelievable that so much could be safely deduced from floor sweepings. But fortunately the analysis of the evidence in this case is such that even a layman can understand and appreciate the methods and logic of the police. The fact that the deductions eventually led to the arrest of the individual sought, gave opportunity to verify their accuracy. They proved to be correct in practically every detail. The kind of suit and hat worn by the alleged spy were determined by gray-wool threads, and animal hair found in the sweepings. The former were recognized as having come from men's suiting, and the latter as part of the "fur" used in making a felt hat.

The personal habits of the individual, his approximate age, and the style of his beard were revealed in a microscopic study of particles of hair found on the



These Cars, Parked in the Courtyard of the Berkeley Police Station, Are Part of the Fleet Used by the Officers in Traveling Their Beats, for Each Officer Covers His Assigned Territory in an Automobile Instead of on Foot

floor. These police have made a special study of hair, and by the diameter of a specimen, the condition of the pith, etc., can tell the sex and age of the person from whom the hair was taken. The thickness of these hair fragments showed that they came from the beard; the finer ones from the cheeks, and coarser ones from the chin. A study of lengths and the angle of the cut plainly indicated that the man wore a Van Dyke beard. The fact that the hair ends were freshly cut and not frayed, showed that the beard was trimmed frequently and not allowed to become irregular and untidy. Since a well-barbered man is almost certainly a neat individual, the police safely deduced that this man was of neat, cleanly habits; while the quality of the cloth in his suit showed that he was well dressed.

In studying other particles in the sweepings, the investigators were taken into a decidedly different field of microscopic analysis. The two things which led to the conclusion that this escaped roomer made trips into the country on foot and was an amateur botanist, were

fine particles of soil and mold, together with a large variety of pollen. The soil particles, these experts recognized as coming not from city streets but such as one would accumulate on the shoes while tramping through fields and forests. The mold particles, once identified, led to the



Berkeley Police Car Fitted with a Wireless-Telephone Outfit, with Which It is Expected Each Car will Shortly be Equipped: Note the Receiver on the Head of the Officer. The City of Berkeley is Reported to Have the Only Completely Motorized Police Force in the United States

same conclusion, while other tiny bits were found, under the microscope, to be pollen. The clever policemen went even further and identified the pollen as coming from a number of different wild flowers, not from hothouse blooms. Hence their deductions.

But the microscope is not the only piece of scientific apparatus employed. While not the only police department employing such a device, the Berkeley police have been among the first successfully to utilize an apparatus called the lie detector. The scientific name is the cardiopneumo-psychograph. The Berkeley apparatus is distinctive from any other apparatus used for a similar purpose and probably has been more extensively employed, having been used in more than 500 actual criminal cases. In not a single instance has it failed to record the fact when a suspect has told a falsehood.

Briefly, the lie detector, by means of sensitive needles, makes a graphic record of a subject's respiration and blood pressure while answering a series of questions, some of which relate to the crime under investigation and some entirely irrelevant. So accurately is this instrument timed that it reveals exactly the lapse of time between questions and answers. It will show the slightest increase in heart action and respiration, regardless of the outward calm of the subject. Admittedly it requires an expert to operate and interpret this instrument and its record. One physician with the research bureau of the Berkeley police school, is such an expert. He never yet has failed to detect when a heart flutter of a subject indicates that he or she is telling a falsehood, and when it is merely natural excitement due to being questioned. What the psychoanalysts call a mental "complex"—a mental disturbance due to conflicting emotions, such as that of fear of detection, or the effort of the mind quickly to formulate a falsehood in place of a truth that normally rises first in the thoughts—such complexes make record on the detector chart that an expert recognizes as unmistakable evidence of falsifying.

In view of the remarkable accuracy of this instrument, Chief Vollmer believes the day will come when its reliability has been so definitely established that its records will be admitted into court as legal evidence. At the present time it is employed in the private examination of prisoners, and is invaluable in giving the police "leads" in the solution of various crimes.

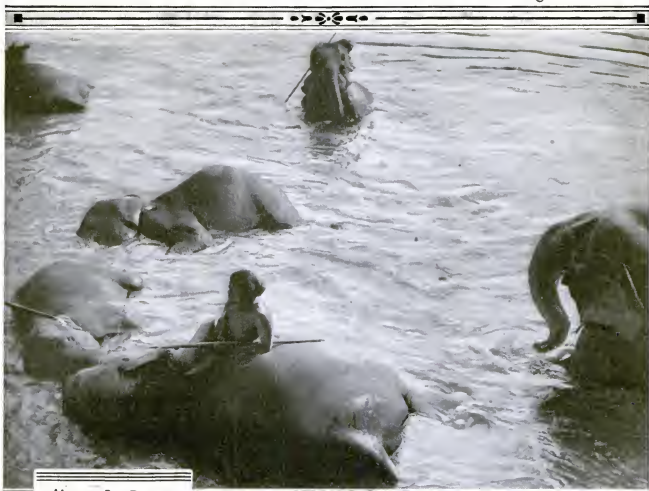
Still another instance of the use of scientific methods is found in this police department's improved method of classifying finger prints. The usual practice is to file the prints of all prisoners by basing the classification on the five or 10 prints of the fingers and thumbs taken as a whole. By the new system, which has

been worked out by Dr. J. A. Larson and R. A. Abbey, each separate finger print is given its own classification, and when a single print or even a portion of a single print is brought to the police from the scene of a crime, the department can tell immediately whether or not it has the prints of that individual on file. The obvious advantage afforded by this more comprehensive system of classification has resulted in identifying the perpetrators of many crimes who otherwise would have escaped.

Another modern innovation in police methods is the use of automobiles by all of the Berkeley officers. None of the men travels his beat on foot. While in a large congested district police patrolling by motor car would not be practical, the Berkeley method is capable of wide adoption, particularly in residential and manufacturing districts. These "mounted" officers cover ten times as much ground as when they traveled on foot and do it with less fatigue. At certain points on each beat the officer "dismounts" and explores an alley or mounts a stairway on foot, thus keeping as careful a watch of the hidden corners as under the old system.

Within a short time it is expected that each policeman's car will be equipped with a radio-receiving outfit. This will enable headquarters to keep in touch with its men at all times, and in case of a sudden need for men in any quarter of the city the commanding officer can start his men on their way without a moment's delay. None has to wait for a street car or patrol wagon, and there are no waits at headquarters due to officers not reporting over the police telephone system.

There are many other ways in which the Berkeley police have utilized science and mechanical devices in making police work a profession. The efficiency of their work is commented on by all who have given it study. Perhaps the best proof of what these advanced methods can do is found in the crime statistics which show a steady decrease in law-breaking, compared with the population. The figures for stolen property are typical of the entire list. In 1909, with a population of 38,000, the value of property stolen was \$19,637; in 1910, population, 40,000, stolen property, \$12,158; in 1914, population, 63,000, stolen property, \$21,492; 1922, population, 75,000, stolen property, \$36,000. These figures are in marked contrast to those of most cities, and yet the showing is even better than first appears, because of the big rise in values of all kinds of merchandise in recent years.



Above: In Preparation for a Hindu Tamil Procession at Colombo, Ceylon, One of the Most Ancient Customs of the Country, the Sacred Elephants are being Bathed before being Clad in Their Gorgeous Draperies. Below: The Tamil Procession in Progress at Colombo, Showing the Native Dancers in the Lead, Followed by Tom-Tom Players



Conf. H. C. Oeteloff, 130 W. Walnut St.

874

POPULAR MECHANICS

397

CORK SHIPMENT BURNS AT BRAZILIAN PORT

A cargo of cork slabs, 2 inches thick, 10 inches wide, and 3 feet long, valued at

\$36,000, just shipped from Spain to Rio Grande, Brazil, and piled near the docks

of that city, was burned recently when, it is believed, a spark from a switch engine near by was carried to the immense pile. The fire department of Rio Grande did not possess equipment adequate to handle a conflagration of such size. In four hours the entire cargo had crumbled to ashes, while 11,000 cement barrels standing close by were also ruined. The cork had been consigned to a cold-storage company and was to be used for insulation in its plant.



Cargo of Cork Slabs as It Appeared While Burning at the Rio Grande, Brazil, Docks, Showing the Laborers Striving to Save as Much as Possible of the Valuable Shipment from the Flames

600

DOCK IMPROVEMENTS PLANNED FOR SOUTHAMPTON, ENGLAND

A specially large floating dock is projected for use in the harbor of Southampton, Eng., that will be capable of lifting from the water the White Star liner "Majestic," the largest ship afloat. The dock is to have a length of 960 feet, a width of 170 feet, and will be built entirely of structural steel. Other harbor

improvements planned for Southampton are in connection with a proposed deep-water quay in the bay at the entrance of the estuary of the river Test. It is proposed to reclaim an area of 460 acres along the river bank where there will be constructed five jetties, each 1,000 feet long and 300 feet wide. Each jetty will be equipped with double-story transit sheds, fully equipped for rapid transshipment of passengers and cargo.

411

QUEER IDOLS BROUGHT BACK BY MISSIONARY

Very odd in appearance is a group of African idols recently brought to this

country by a missionary. They were carved by natives of Nigeria. One of

the group, "Ifa," a queer-looking image with a high-crowned hat, was the principal deity of Nigeria when the missionaries began their work there. Besides "Ifa," the collection includes an odd-shaped club, feared by the natives as the god of thunder and lightning. Another is a brass image, "Oshubgo," a mystical feminine deity who rules over a society of fanatics. In contrast to these, the missionary also secured several crucifixes carved from ivory by Christianized natives.



Collection of Queer African Idols and Christian Crucifixes, Which were Carved from Various Woods and Ivory by the Natives of Nigeria and Brought to This Country by a Missionary

timber trade supplement, 9/30/22

Conf. H. E. Thomas, 911 Linnell Ave. Portland, Ore.

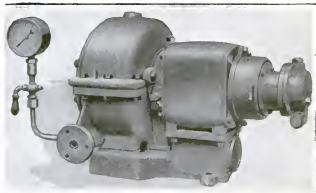


Test of Safety Venting Device on a 50-Gallon Drum, Containing 25 Gallons of Gasoline, before Government Officials: A Brisk Fire under the Drum Caused the Gasoline to Burn without Exploding

SAFETY VENTING ATTACHMENT FOR GASOLINE CONTAINERS

A spectacular test of a venting device that safeguards from explosion cans, drums, or tanks containing gasoline or other volatile liquids, was recently made at the Bureau of Standards in Washington. A brisk fire was ignited beneath a 50-gallon drum, containing 25 gallons of gasoline. When the drum became heated, the gasoline, instead of exploding, first blew off a safety cap, and then shot out in the form of a large jet of flame. The safety appliance that is screwed into the bung-hole, or other opening, is fitted with a gauze screen similar to that used in mine safety lamps, thus preventing the passage of flame into the container. This gauze-covered opening is closed with a cap soldered into place with a metal that melts at a temperature lower than the explosive temperature of the gasoline.

air fan for cooling the shaft bearing at this point, and which acts also as a stuffing box for the turbine. The turbine is very simple, and the steam requires no control, for the air fan acts as a governor, preventing racing, and keeping the speed uniform at all loads. The lamps in the train remain remarkably steady, and there is a very small variation of voltage, no



Electric Generating Unit, Showing the Turbine at the Left, Which is Direct-Connected to the Dynamo, with a Fan between Them, All in One Housing

TURBINE AND DYNAMO UNITS FOR TRAIN ILLUMINATION

Small enough to be mounted almost anywhere on a locomotive is a compact unit consisting of a direct-connected dynamo and steam turbine, that has been produced in Switzerland to provide for train lighting. In the housing for the turbine, between it and the dynamo, is an

matter how many or how few lamps are in operation.

For use in places difficult to reach with the ordinary screwdriver, a wood screw has been provided that has a square socket in the head, instead of the usual groove. The screwdriver is particularly adapted for overhead work.

*Maschinenfabrik Oerlikon, A. S. de Construction
Oerlikon, Switzerland*

U.S. Jacob Kohler, London, England.

Com. Harry Seaman
798 Hunterdon St.
Newark N.J.

POPULAR MECHANICS

TWO BUILDINGS COLLAPSE WITH NO INJURIES



Ruins of the Two Buildings Which Collapsed Because of Excavations being Made underneath One of Them, Showing the Havoc Caused and the Narrow Escape of the Inmates

Two four-story buildings collapsed recently, in Newark, N. J., the disaster being caused by excavations under one of the structures. One of the buildings contained a saloon and the other a restaurant. When the workmen detected a slight trembling of the walls, at 8:00 o'clock in the evening, they were terrified and rushed up to the street, shouting a warning. The actual crash, however, did not come until 2:00 o'clock in the morning.

LEGION MEN LODGED ON TRAINS AT NEW ORLEANS

The provisions made for housing soldiers, sailors, and ex-service men at the annual convention of the American Legion held this year at New Orleans, had one feature which is believed to be an innovation in hotel arrangements. Several hundred specially chartered sleeping cars of the Illinois Central Railroad were sidetracked in one of the company's large yards. Close by, warehouses were fitted with extra lavatories, lockers, shower

baths, laundries, pressing stalls, barber shops, reading rooms, telephone booths, and other conveniences. The regular porter service was further strengthened by a squad of messengers, dining cars were kept going in full blast, and everything possible arranged for the comfort of the guests. For example, a taxi service was maintained to the business and theatrical district. The "hotel on wheels" accommodated more than 3,000 persons.

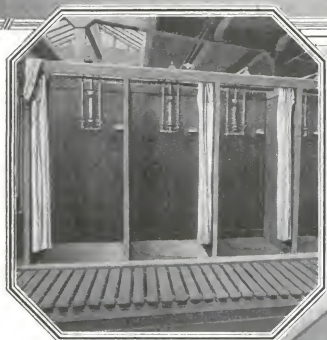


Regular Sleeping Cars "Parked" in the Company's Yards at New Orleans during the Recent Knights Templar Convention When the Scheme was First Tried Out on a Small Scale: The Heart of the City can be Reached by a Few Minutes' Walk

506
Data from Mr. Corbeth, Advertising Manager of Illinois Central R.R., d.c. Building 1244 St. of Chicago

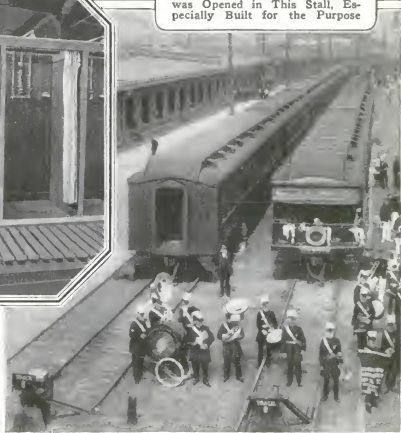


A Branch Office of a Laundry and Clothes-Pressing Company was Opened in This Stall, Especially Built for the Purpose



Above: One of the Numerous Groups of Shower Baths Placed So as to be Reached Easily from the Trains

Right: Looking down the Yard, Showing to One Side the Warehouses Which Had Many of the Conveniences of a Large Hotel



Inside One of the Warehouses: The Door at the Left Leads to the Shower Baths. Near the Center Are the Lavatories, and to the Right the Steel Lockers

Cont. of L. Harbours
102 Lincoln Ave.

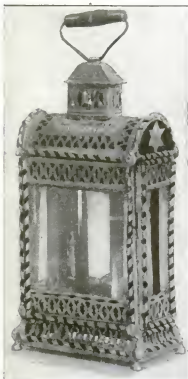
div. George W. Wymelin
1615 Clarkson St.

878

POPULAR MECHANICS

71 All River, Mass. OLD CAN MADE INTO LANTERN BY BOYS IN ASIA MINOR

That necessity is the mother of invention is well illustrated by a youth of Sivas, in Asia Minor, who from an old



gasoline can, which would certainly have been discarded in a more prosperous land, has fashioned an ornamental lamp. The top, cut with triangular figures, and bordered with a spiral fringe, is surmounted by a small house which forms a base for the handle. Running down the side are other spirals, while the base section has

also been changed into a series of fancy designs. The lamp is but one of many ingenious articles from bits of scrap made by the boys and men of this country.

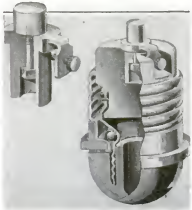
FILM-REWINDING ATTACHMENT —STOPS MISFRAMED MOVIES

Movie pictures that become divided on the screen, or get "out of frame," are caused by improper splicing of the ends of cut or broken film. A west-coast inventor now has completed a little machine for overcoming this annoying trouble. An idler sprocket, with a stand for clamping to the table, is placed between

the two film reels in rewinding, and the film is threaded over it and held in place by small rollers. The sprocket has a circumference equal to 18 film pictures, and lines marked across its face to indicate correct divisions between the pictures. When, in rewinding, a splice passes the rollers, the operator is warned by a click, and viewing the splice by the aid of a tiny lamp below, is able to check its accuracy and correct it if wrongly made, assuring a complete reel of film without a misframe. The detector is also useful in making "fade-outs," where the picture has a slowly diminishing border.

ROTATING ATTACHMENT PLUGS FOR ELECTRIC FIXTURES

The twisting and consequent breaking of wires attached to electric appliances such



as flatirons, toasters, heaters, etc., is a universal annoyance. To remedy this, an inventor has produced a rotating attachment plug, of which the center portion turns freely when the wires are

twisted, thus keeping them from breaking or pulling loose from the binding screws.

¶The New York post office has decided to reopen the pneumatic mail tubes which were closed four years ago by Postmaster-General Burleson. It is thought that use of the tubes will speed up mail deliveries and at the same time aid in reducing the volume of traffic on the city streets.

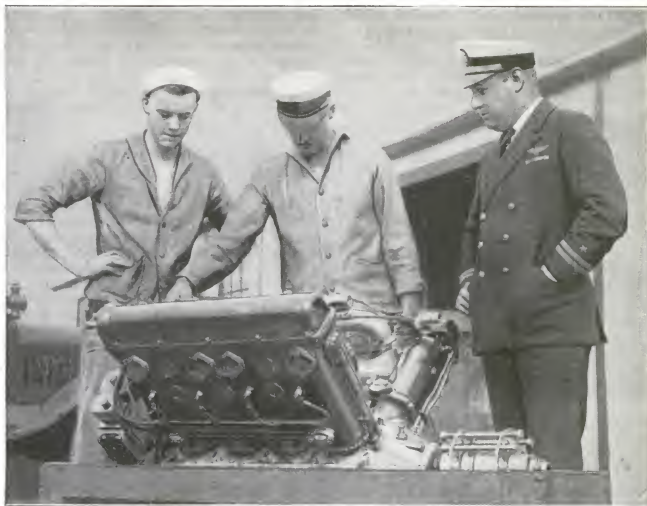


From Left to Right: The Misframe Detector Shown Mounted between the Two Film Reels; the Operator in the Act of Lowering the Clamp That Holds the Film in Place; Looking Down upon the Detector, Showing the Small Rollers That Guide the Film, and the Light from the Tiny Lamp Below

345 Q. Farrell St.

Francisco
4988
J. W. Wright H. Smith
1460 Elton St. San Francisco

*mfr. Aeromarine Plane
+ Motor Corp., Kenosha, Wis.*



COPYRIGHT, UNDERWOOD & UNDERWOOD

New Eight-Cylinder Air-Craft Engine Recently Tested by the Naval Bureau of Aeronautics: After a Total Run under Load Lasting 300 Hours, the Engine was Found to Be in Perfect Condition

AERIAL ENGINE ESTABLISHES NEW ENDURANCE RECORD

Realizing that the most important present development in air-craft engines is their durability, the Naval Bureau of Aeronautics recently increased their endurance tests to as much as 300 hours, in three runs of 100 hours each. The purpose of such a long test was to run the engine to destruction, and thus determine its exact length of life. But to the surprise of the bureau, one engine, designed originally for the airship "ZR-1," instead of being run to destruction, was still in perfect condition at the end of the 300-hour test. Experts of the bureau state that this new air-craft engine has established a world's record for fuel economy, as well as for durability. It is, they say, the best air-craft power equipment ever developed. The engine is of the 8-cylinder, V-shaped type, and develops an average horsepower of 175. This would be sufficient to propel a five-passenger airplane at a speed of about 80 miles an hour, which in 300 hours would be equivalent to flying around the world.

HEADLIGHT CONTROLLER DIMS LIGHTS GRADUALLY

Too abrupt dimming of automobile headlights is a menace to the driver on

Too abrupt dimming of automobile headlights is a menace to the driver on account of the sudden change from brightness to darkness, and a headlight controller is now being manufactured that enables the driver to dim the lights gradually to any degree necessary. The hands of the driver never being off the steering wheel, a touch with one finger of a lever on the steering post is all that is necessary to dim the lights as gradually as desired. The controller can be installed on any steering post in five or ten minutes, a screwdriver being the only tool needed. It is strongly made and has a highly polished nickel-plated finish.



*Universal Headlight
Controller Co. 1125 12th St.
57th St Broadway New York*

Joia Rangnetier Co.
2812 Cedar Ave.

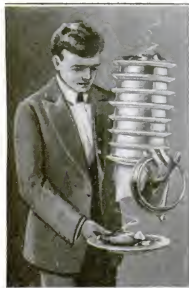
880

POPULAR MECHANICS

Cleveland, Ohio. **METAL RINGS KEEP FOOD HOT WHEN SERVING BANQUETS**

555

The carrying of as many as eight dinner plates in pyramid fashion with metal rings between them is a new practice employed by hotels and restaurants to insure warm food and quick service.



The rings, about 2 inches high, are made of either aluminum or silver, with top and bottom edges lined with rubber. In addition to being a convenient way of carrying the plates, the

rings form an air-tight wall about the food, keeping in the original warmth and moisture. The system is especially advantageous in serving banquets and other large parties.

BASCULE BRIDGE CONTROLLED BY MOVING COUNTERWEIGHT

A new bascule railroad bridge, with a span of 162 feet, across the Rouge River at Detroit, Mich., the first of its kind ever built, has a movable counterweight which controls the raising and lowering of the bridge. In every other respect it is like

any trunnion bascule bridge. The counterweight weighs 1,000 tons, and is supported at a considerable height above the bridge in a strong steel tower, at the apex of which are bearings for trunnions, on which the counterweight swings at the end of connecting brackets radially at some distance from the center line of the trunnions. This movement of the counterweight is controlled by machinery installed inside a cabin on a transverse steel girder, that travels up and down two inclined steel supports moving the counterweight with it. The machinery is driven by a 50-horsepower motor, another similar one being provided for reserve power. Thus the counterweight is shifted with relation to the bridge trunnions so that, when it is directly above them, it holds the bridge closed, and when moved to a position at some angular distance from the bridge trunnions, opposite to the bridge, its downward pull forces the bridge upward, opening it. The tower supporting the counterweight is above the approach, which is 73½ feet long.

NEW LEEWARD ISLAND STAMPS DEPICT HISTORICAL ERROR

On the new stamps issued for St. Kitts and Nevis, two of the Leeward Islands in the British West Indies, their discoverer, Christopher Columbus, is depicted with a telescope in his hands. Quite justifiably the French Astronomical Society expresses surprise at such a display of ignorance. As a matter of fact the first practical telescopes were made in Holland more than a century later than the discovery of the Leeward Islands in 1498.



Left: New Type of Bascule Bridge Operated by a Moving Counterweight. Shown Open with the Counterweight Moved Down into the Supporting Tower. Right: The Bridge is Shown Closed with the Counterweight Moved Radially Upward, So That It Hangs Directly above the Bridge Trunnions

American Bridge Co.
71 Broadway, New York City
1950

Spartanburg, S. C.



The Employees of a Southern Cotton Mill may Stay a Week on This Houseboat during Their Vacation Period, Paying Only a Dollar for Food and Necessities. The Boat is Owned by the Mill and is Kept on Lake Summit, North Carolina

391 COTTON MILL HAS HOUSEBOAT FOR USE OF EMPLOYEES

For the vacation pleasure of its employees the use of a 60-foot electrically lighted houseboat with six sleeping rooms, a kitchen, living room, and porch, is granted, practically without charge, by a South Carolina cotton mill. Arrangements are made so that each employee may spend a week on the boat, paying for this privilege only the nominal sum of one dollar, which is used for food and other necessities. The boat is kept on Lake Summit, North Carolina, in the beautiful "Sapphire" country, often spoken of as the "Land of the Sky." Excellent recreational possibilities are to be found in this section. The floating home has two large staterooms fitted with bunks, one for boys and the other for girls, while two smaller rooms are for family use. Then there are two rooms for chaperons, a kitchen, a good-sized living room, and a porch which extends all about the structure.

504 EARLY-DAY BICYCLE RIDDEN ON TRIP TO CHICAGO

Riding a high-wheel bicycle from Indianapolis to Chicago was the rather exciting task recently assigned to an employee of an electric railway. The trip, made for advertising purposes, consumed eight days, with a convention of electric-railway companies in Chicago as the final stopping place. Procuring the bi-

cycle was not an easy matter, and special tires had to be made before it could be used. But the journey itself was the most difficult part of the scheme. The rider, of course, had to sit quite a few feet from the ground, so that wending in and out of traffic, and spinning down high hills without any brakes, was not without its thrills.



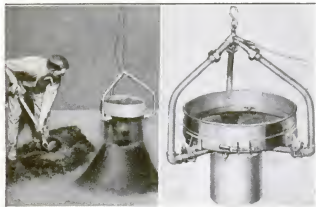
This Old-Time High-Wheeler was Recently Ridden from Indianapolis to Chicago. The Absence of Brakes Helped to Make the Trip an Exciting One

Indianapolis Street Railway
Indianapolis, Ind.

431

ELECTRIC-SIFTER PRINCIPLE FOR STRAINING LIQUIDS

A manufacturer of a successful electric sifter, which has been used as a sand

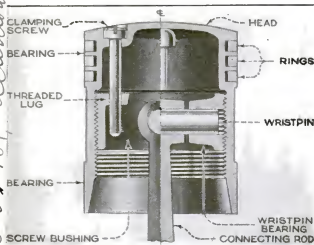


Left: Electric Sifter in Use as a Riddle for Molding Sand. Right: Close-Up of Sifter Which can be Inclosed for Liquids

riddle on the molding floor of foundries and for similar purposes, has developed this idea in making a device that sifts out material suspended in liquids. The machine is wholly inclosed except for the half-closed top which prevents the liquid from splashing over, and the delivery spouts for the oversize and the material that passes through the screen.

ADJUSTABLE PISTON CONTROLS COMPRESSION-SPACE VOLUME

For experimental purposes, it is frequently desirable to regulate the volume of the compression space in an internal-combustion motor, particularly in testing with different grades of fuel. A new design of piston combines the head and skirt in one piece, which is internally threaded and provides an easy adjustment with the wristpin and wristpin bear-



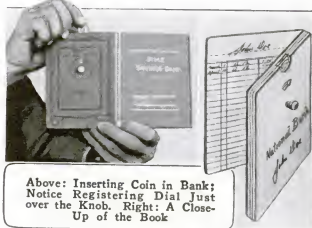
An Adjustment between the Wristpin Holder and the Body of this Piston Makes it Possible to Vary the Compression Space

ing that screw into it. Two machine screws, let into the piston head, clamp the wristpin bearing firmly in its position, which may be varied as little as $\frac{1}{32}$ inch by a half-turn.

DIME BANK IN REAR COVER OF NEW SAVINGS BOOK

419

A dime bank is arranged in the rear cover of a new savings-account book, which, aside from the slightly increased thickness of this cover, does not differ in general appearance from the ordinary bank book. The coin, inserted in an opening at the top, falls into a small pocket on the outer edge of a revolving disk, which is then turned by means of a small knob on the outside of the cover. An opening above the knob shows the



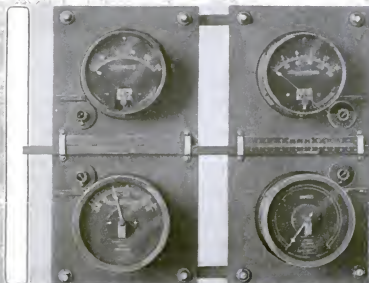
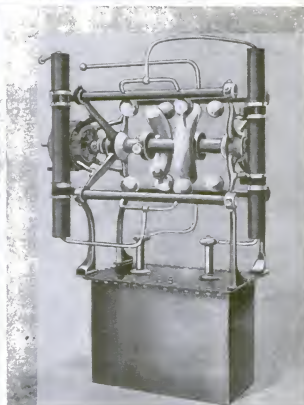
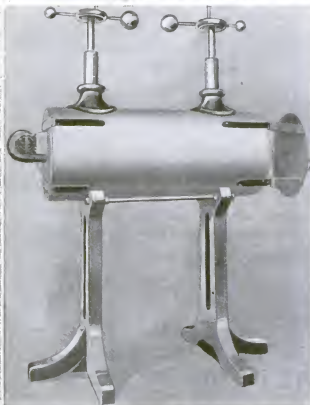
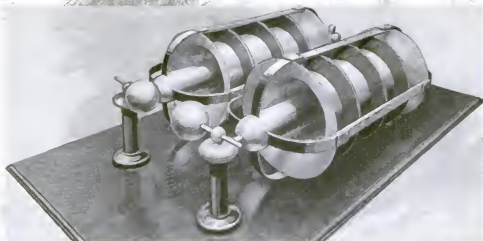
Above: Inserting Coin in Bank; Notice Registering Dial Just over the Knob. Right: A Close-Up of the Book

amount in the bank after each insertion of a coin. To remove the savings, a sealed label is cut by the bank cashier.

PRECISE CONTROL OF DOSAGE IN X-RAY THERAPY

Precise control of dosage in X-ray therapy is now possible by the use of apparatus that includes a rectifier which is absolutely constant in its form of wave rectification and by which anything from the longest length of wave down to the shortest, may be given. Much of this is due to an improved spark gap. Instead of the pointed, revolving spark gaps seen on the rectifiers of the past, the new outfit contains spherical stationary electrodes, while the revolving electrodes are arc-shaped. An air condenser, in conjunction with a crest voltmeter and a precision milliammeter, is also included. These efficient appliances, which have been mounted compactly in and on a cabinet and control stand, should prove a valuable aid to X-ray work.

350 International X-Ray Corp.
326 Broadway New York City



At the Top is Seen the Air Condenser of the Precision X-Ray Apparatus Which Accurately Measures the Dosage

Center Left: Protective Tube Holder Which Confines All of the Intense X-Rays Not Wanted for Treatment

Center Right: Rectifying Unit of the X-Ray Apparatus, Showing the Peculiar Design of the Spark Gaps

Bottom: Meter Panels of the Installation, Showing the Sliderule Which Yields Accurate Calculation



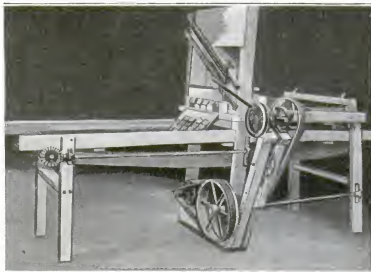
The Woman Bather Stands before the Collapsible Tent Which Makes a Convenient Dressing Room

SMALL, EASILY ERECTED TENT AS BEACH DRESSING ROOM

For motorists and others fond of country bathing, a one-piece collapsible tent which when set up forms a dressing room, is an attractive manufactured article. It is 3 feet square and 6 feet high. On the interior sidewalls are hooks on which to hang clothing, and two large pockets for miscellaneous possessions. Guy ropes and pegs are furnished for use in windy weather. When folded, the tent is about the size and shape of a golf bag and can be carried conveniently on the running board of an auto, over the handlebars of a bicycle, or in other ways. The tent might also be found useful as a temporary ticket office or telephone booth.

AUTOMATIC SLICER CUTS LOAVES RAPIDLY

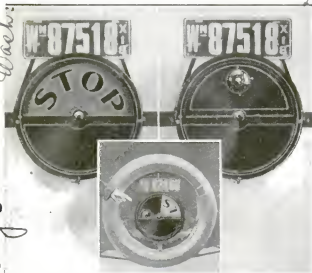
A mechanically operated bread slicer, driven by a motor or other suitable power, has been designed for use in places where large quantities of bread are required. The loaves are placed in rows on a conveyor which carries them lengthwise to the knife where the slicing is done. The slices fall into pans on a second and lower conveyor and are deposited in a basket or other container at the end of the machine. The slicing knife is controlled by brakes on slanting bars, which are moved back and forth by a link operated from a crank wheel.



This Slicing Machine Has Two Conveyors, One above the Other, on the Upper of Which Loaves of Bread are Deposited in Rows and Carried to a Power-Driven Slicing Knife at the Front

AUTOMOBILE STOP SIGNAL UTILIZES TAIL LIGHT

An exceptionally conspicuous automobile stop signal has been designed recently. It is mounted in front of the regular tail light, and is composed of a large, flat, circular frame with its center below the light and a semicircular opening in front of it. Inside this is mounted a rotating disk, which in its normal position has a circular glazed opening directly in front of the tail light. The disk is connected by a cable to either the brake pedal or the emergency-brake lever, and the application of the brake rotates the disk, exposing its lower half, on which is the word "Stop" in letters of red glass set in an opaque background. The warning can be read a block away.



Three Views of Automobile Signal, Showing It with the Stop Signal Exposed; in Normal Position with Tail Light Showing, and in Operation

Inv. H. E. Byrdline, 7
Subst. Munn
Inv. W. E. Root,
400 Pacific Block, Seattle,
Wash.

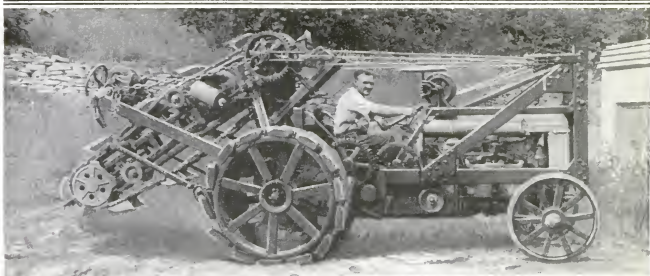
26

6,500,000

DEVICE CONVERTS TRACTOR INTO TRENCH DIGGER

W. Dayton, Ohio. Box 842

BY means of a new attachment, it is now possible to convert a small tractor of the agricultural type into a mechanical trench digger with nothing more than a monkey wrench and without any alterations to the tractor. The compactness and light weight



Above: A Tractor, Equipped with New Trench-Digging Machinery, is Here Shown Ready to be Transported. Right: Tractor Trench Digger at Work on Deep Vertical Ditch. Below: Another View of the Tractor with the Attachment by Which It is Converted into a Trench Digger in an Hour

ditch digger that is capable, it is claimed, of doing the work done by machines weighing two or three times as much. The new ditching device is so constructed that it can be attached to the tractor in about an hour



of this machine enable it to do many kinds of work not feasible with the heavier machines, such as shallow trenching for surface drains and concrete curbing, and it can also dig deeper ditches without the necessity of keeping the traction wheels level. Its short turning radius of 17 feet is an advantage in many places, and it can be transported either by its own power or on almost any flat-bottom 3 or 5-ton motor truck.

385

International Newsreel Corp
Aeronautics *military*
New York City

LARGEST BOMBING PLANE IN AMERICA



THE largest bombing plane in the country, recently completed for the U. S. Army Air Service, was given a preliminary test and try-out on September 21, at Mitchell Field, Mineola, L. I., before a number of interested spectators, including Maj. Gen. Mason Patrick, chief of the service. This new bomber, which represents the last word in planes of its type, is powered by three Liberty motors, enabling it to attain a speed of 106 miles an hour, and can carry two 4,000-pound bombs. The "Owl," as the new machine is called, is expected to take a prominent part in an interesting demonstration of night bombing soon to be given. In the picture above, the "Owl" is shown on the ground with the "Sperry Messenger"—the smallest airplane in the U. S. Air Service—alongside. At the left, General Patrick is seen, followed by Lieutenant Melville, climbing into the cockpit of the "Owl" for a trial flight. It is 53 feet 9 inches long, has a wing spread of 106 feet 8 inches, and weighs over 10 tons.

It has been announced that another and larger bombing plane—probably the largest airplane in the world—is expected to be ready for a try-out the latter part of November. This new bomber is of the triplane type, with a wing spread of 120 feet, a height of 28 feet, a length of 65 feet, and a fuselage 10 feet in diameter. It will carry 10,000 pounds of bombs and is motored with six 400-horsepower Liberty engines which will consume 180 gallons of fuel an hour.

TRIED OUT BY UNITED STATES ARMY

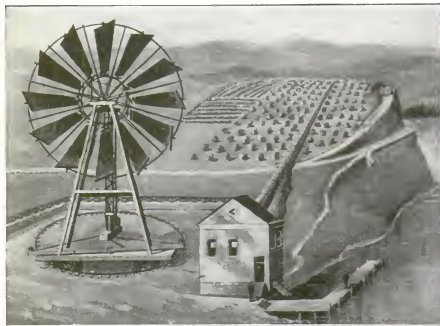


Major General Mason Patrick, Chief of United States Army Air Service, inspecting the "Owl," the Largest Bombing Plane Yet Built for the Service: It Is the Last Word in Machines of Its Type, is Powered with Three Liberty Motors Which will Give It a Speed of 106 Miles an Hour, and will Carry Two 4,000-Pound Bombs

317 WINDMILLS ON COLUMBIA RIVER FOR IRRIGATION

Along the banks of the Columbia River it is planned to erect large windmills near

the water's edge for the purpose of irrigating the high bluffs that line the river



One of the Projected Windmills and Pump Houses for Irrigating the High Bluffs That Line the Columbia River for Many Miles: The Tower of the Windmill Swings upon the Circular Track

9993

VACUUM-CLEANING APPARATUS USED ON CITY STREETS

Huge vacuum outfits have recently been put in operation at St. Louis, Mo., for street-cleaning purposes. The odd-appearing appliance is mounted on the chassis of a motor truck and includes a two-wheeled trailer, which carries the

sults have been attained with these new cleaners, that other cities are said to be considering similar equipment.

40 FORTY-POUND COCONUTS TAKE 285 SEVEN YEARS TO RIPEN

The "coco de mer," a variety of coconut which made famous the island of Mahe of the Seychelles Archipelago in the Indian Ocean, weighs 40 pounds or more, requires seven years to ripen, and grows on trees that attain a height of 100 feet and do not show their enormous fernlike leaves until 35 years old. This "coconut of the sea" was known long before the islands were discovered, because of the sea-borne specimens cast up on the east coast of Africa, where they were thought to grow on a submarine palm. They were valued as an antidote to poisons and commanded exorbitant prices among the native tribes, whose medicine men made much of them.



Two of the Huge Vacuum-Cleaning Outfits Which are Used on the Streets of St. Louis, Showing the Large Suction Fan Mounted on the Motor Truck, and the Compartment for Refuse on the Trailer

compartment for the deposition of the picked-up refuse. Such remarkably re-

native tribes, whose medicine men made much of them.

furnish truck with power takeoff which can be used to operate cleaner.

national Geographic Release. Aug. 14th.

The White Motor Truck Co. Cleveland O.



A Party of Fiji Islanders on a Fishing Expedition: They First Put into the Water a Quantity of Tuba Poison, Which So Stupefies the Fish That, after About Five Minutes, They are Easily Speared and Picked Up in the Shallow Water

SOUTH SEA ISLANDERS EASILY CAPTURE DRUGGED FISH

When natives of the Fiji Islands and certain sections of Borneo start out to make a big catch of fish, which is one of their main sources of food, they dump into the water a quantity of tuba poison obtained from the roots of a local plant. In about five minutes, the fish come to the surface in a dazed condition and are speared and picked up by members of the fishing party. After the fishermen are satisfied with the haul, the remaining fish are left to recover with apparently no ill effects. In Borneo this method is used in small streams where the natives assemble in 20 to 50 canoes above a point where a latticework barrier has been placed across the river to catch any fish that escape the spears. The Fiji islanders wade into the shallow water along the seashore to get the stupefied fish.

—9591

THREE-LIGHT SIGNAL MARKS RAILWAY CROSSING

To warn motorists at night that they are approaching a railway crossing, as distinguished from a regular boulevard intersection, a special street signal is now being tried out in Detroit, Mich. The



This Street Signal Has the Usual Large Red Globe and Two Additional Smaller Red Lights near the Base, to Indicate a Railway Crossing

W. L. Potts, Supt. Detroit Police Signal Bureau, Detroit, Mich.

249 *Madison Wis*
CIRCULATION OF KILN AIR
SHOWN BY ACID FUMES

Determining the movement of air in dry kilns by the use of a combination of



Lumber Dry Kiln, Showing Apparatus for Blowing Hydrochloric Acid across Ammonia to Produce Fumes for Determining Whether the Air is Circulating in a Proper Manner

hydrochloric acid and ammonia fumes, is the method developed at the Forest Products Laboratories, at Madison, Wis. These fumes, being of approximately atmospheric temperature, remain practically

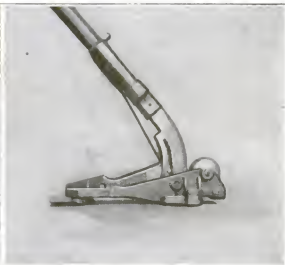
motionless in the air unless disturbed by air currents, thus readily indicating the presence, or lack, of proper circulation for lumber-drying purposes.

460
CAST-IRON PROPELLERS MADE
AS SMOOTH AS BRONZE

The surface of a cast-iron ship's propeller can be made as smooth as one of bronze by the use of an enamel coating, recently produced in Europe. Besides providing the cast-iron propeller with a permanently smooth surface, the enamel is sufficiently strong to withstand the vibration, a property commonly lacking in other such coatings. The enamel is anti-fouling, as well as anticorrosive. With equal efficiency, an enameled cast-iron propeller costs about half as much as a bronze one. It is, therefore, not surprising to learn that this enamel is being increasingly adopted.

337
ADJUSTABLE FULCRUM FEATURE
OF NEW CAR PUSHER

The feature of a recently invented car pusher, now on the market, is the adjustable fulcrum which can be varied from one to six inches by the simple turning of the handle. By taking advantage of this, a short stroke with a long leverage can be used for starting the car, and a longer stroke with a correspondingly shorter leverage can be applied as soon as the car is in motion. The car pusher automatically grips the rail when the car is being pushed, but readily releases it when being advanced to follow up the wheel. With it one man can start four loaded cars and keep them moving at a walking speed.



Left: With This Car Pusher One Man can Start and Keep in Motion Four Loaded Cars. It is Operated by Working the Lever Up and Down. Right: Close-Up of Car Pusher Which Automatically Grips the Rail and Has an Adjustable Fulcrum.

*The Specially Mfg Co 11400 Madison Ave
 Cleveland Ohio.*

*Delix. Marchenbaum Co.
 Berlin. Germany
 (no other address)*

**PSYCHOLOGY OF COLORS MADE
442 SUBJECT OF STUDY**

The psychology of colors and the proper use of them in decorating the interiors of hospitals, sanitariums, schools, and even homes, has been made the subject of study in Germany. Notable facts were discovered concerning their different effects on the mind and the emotions. White makes a room appear larger and lighter, but cold and empty, while yellow gives an appearance of sun warmth and produces a sense of comfort. A crimson hue imparts an air of delicacy. Children in a room with crimson-tinted shades were observed to work eagerly and more than was customary. Orange exerts the most marked effect of warmth and cheerfulness. Red represents spontaneous youthful joy, but is said to be the hardest on the eyes. Blue has a calming and soothing effect. Violet is extremely depressing, while, on the other hand, green possesses a restful influence. Gray, if it covers a wide area, is barren and dreary, and persons in a room of this description soon become downcast and evince lack of interest in their activities or well-being. Although these conclusions may not be universally true, they at least deserve attention among thinkers, since the acknowledged goal of human effort is efficiency.

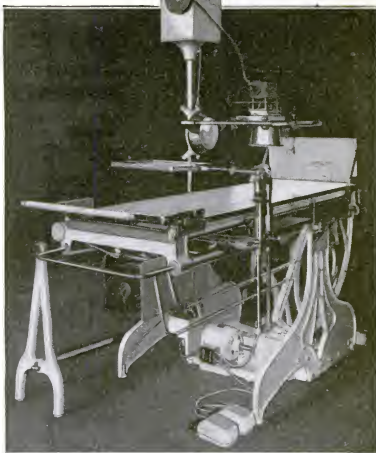
**MEN'S SOFT CAPS PREVENTED
FROM SAGGING IN FRONT**

To take the place of tissue paper that is often inserted in men's soft caps to prevent the front of the cap from sagging, and thus spoiling its appearance, a stiffener, made of fiber covered with a waterproof fabric, is now on the market. When inserted under the front of the soft cap, this holds it in proper shape. The device is light, flexible, and easily kept clean.



**IMPROVED X-RAY EQUIPMENT
307 FOR MEDICAL USE**

An improved X-ray plant for physicians has a tilting table that can either be changed quickly by hand to



In This Improved X-Ray Machine All the Moving Parts are Counterbalanced and Mounted on Ball Bearings

any position between the horizontal and vertical, or slowly moved by an electric motor, while a diagnosis is being made. The moving parts are counterbalanced regardless of angle. A 75,000-volt transformer supplies a radiographic tube above the table, the holder of which is universally adjustable and indicates the accurate placing of the tube. The apparatus is equipped with an automatic plate-changing device. A 65,000-volt transformer supplies the fluoroscope tube, placed beneath the table, for use without a photographic plate. Both tubes are adjustable to any part of the table and, like all the moving parts, are mounted on ball bearings.

In Czecho-Slovakia, where Bohemian glass is manufactured, the important discovery has been made of a silica with which raw glass can be manufactured without the aid of other ingredients. The mineral is of volcanic origin, and there are very extensive deposits of it.

The Rappform Agency
2373 E 55th St
Chicago

Way + Purtle Mfg Co
6701 Moneta Ave.

Cohn. Hall, merr Co
93 Franklin St
New York.

892 314 *Los Angeles Calif* POPULAR MECHANICS
HOLDER KEEPS GARBAGE CAN
FROM BEING STOLEN

m. & Haskel OPERATE COTTON-GOODS LOOM
243 BY WIRELESS

By means of a new metal frame, garbage cans may be fastened to a wall,



post, or tree, making theft difficult if not impossible. The frame encircles the bottom of the can, which is held a few inches from the ground, and then runs up and above the can itself. The side braces, of which there are three, form guides for the lid whenever it is to be raised. Under no conditions can the lid be removed, though

with the cover raised the can itself may be lifted out of the frame to be emptied.

CHOCOLATE-PERSIMMON BARS
A NEW KIND OF CANDY

In spite of its astringency, the unripe fruit of the persimmon has been made into candy in one of the southern states in which the tree abounds. After several unsuccessful attempts to remove this



quality from the persimmon, it was finally done by means of a chemical preparation that releases cream of tartar, which is an essential in

candy making. Sufficient sugar was then added to make a sweet paste, from which a delicious chocolate-coated confection was made without any trace of the persimmon astringency. Methods of preserving the candy have been developed, and it is intended to form an organization for gathering the fruit on a large scale, and merchandising the candy.

Wireless control of a cotton-goods loom was a feature of a fashion show recently held in Baltimore, and excited considerable comment among the spectators. An ordinary automatic loom was used. The starting and stopping of the machine, which was effected every 15 minutes, was under the control of an operator located in a distant section of the city.

ELECTRIC WATER HEATER
FITS ON FAUCET

Heating water as it passes out of the faucet, is possible with the use of a small electric appliance that can be fitted over the end of any ordinary spout. The



heating element consists of graphite plates, over which the water flows, instead of the usual wire-coil type, the electrical connection being made by the passage of the water. The entire outfit, including the extension cord for attaching to any light socket, weighs less than two pounds. Thus

the contrivance should be an ideal portable heater for use in emergency surgical cases, or on any occasion where hot water is needed on short notice.

POPLARS NEAR SIDEWALKS

"OUTLAWED" IN DETROIT

The poplar is never content unless its roots are plugging sewers and breaking sidewalks and pavements, according to the Detroit Department of Parks and Boulevards, so the city council was recently prevailed upon to pass an ordinance "outlawing" 40,000 of the trees located between the sidewalks and curbstones in that city. The resolution gives authority to chop down the trees whenever they seem to be causing trouble.

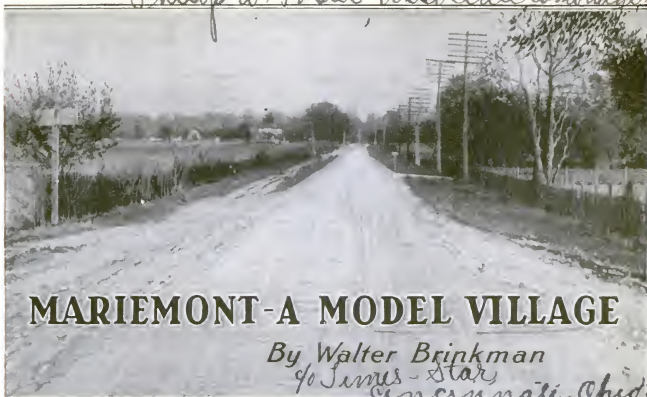
electrical news
9/8/22

*mp. A. H. Kandy
Los Angeles, Calif.*

*Draw. W. H. Kandy
Los Angeles, Calif.*

*new Orleans
La*

9547 John Nolen, City Planner.
Philip W. Foster Associate, Cambridge, Mass



MARIEMONT-A MODEL VILLAGE

By Walter Brinkman

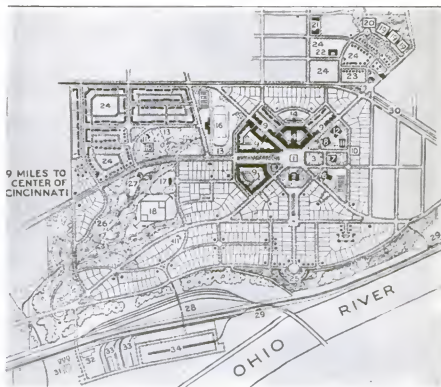
of James Star
Cincinnati, Ohio.

Looking along Wooster Pike Where It Crosses the 365-Acre Site of the Projected Model Town of Mariemont: The View Shows the Farm Buildings and Fields as They Were When the Land was Acquired

IN an attempt to solve the housing problem by the formation of a community in which people of moderate means may obtain good homes with attractive surroundings, either by rental or purchase, at small cost, the model town of Mariemont, adjoining Cincinnati, Ohio, has been planned. The enterprise is not intended to be philanthropic in its nature, but is to be conducted so that the members of the community will be provided with hygienic and attractive homes at little more than actual cost, while leaving a reasonable margin of profit on the funds furnished for the project. When completed, it is hoped it will be a demonstration to be imitated.

The general plan covers a tract of about 365 acres, providing for a town center with its village green, library, community building, public market, bank, hotel, theater, town hall, post office, and a business center with all kinds of stores, and above

them apartments. Just outside this center is a school, and beyond it a large stadium, besides a football field, tennis grounds, and a running track. The



Objects of Interest on Town Site, Shown Numbered as Follows: 1, Town Center; 2, Town Hall; 3, Village Green; 4, Theater; 5, Bank; 6, Community Building; 7, Library; 8, Post Office; 9, Stores; 10, Fire Station; 11, Churches; 12, Hotel; 13, Schools; 14, Market; 15, Cemetery; 16, Stadium; 17, Field House; 18, Athletic Field; 19, Hospital; 20, Convalescents' Home; 21, Convalescents' Workshop; 22, Barn; 23, Pensioners' Cottages; 24, Gardens; 25, Concourse; 26, Park; 27, Lagoon; 28, Railroad Yards; 29, Railroad Stations; 30, Street-Car Line; 31, Sewage-Disposal Plant; 32, Garbage-Disposal Plant; 33, Freight Yards; 34, Industrial Section



The Hospital Group of Buildings Which are Situated near the Convalescents' Home

churches will be in the outlying residential quarters, where there will also be a public park of over 50 acres, including athletic fields, a bathhouse, and a lagoon. There will be 759 house lots, some with from 50 to 80-foot frontages, 120 feet deep, and others smaller for semi-detached buildings. All the houses will be of brick or other permanent material. To aid purchasers of homes,

there will be a subsidiary building and loan association, which will furnish the necessary funds at a low rate of interest.

The streets are to be from 40 to 150 feet wide, and will have a total length of over $8\frac{1}{2}$ miles. All will be boulevarded and adorned with trees, the widest having car lines that will furnish ample means of transportation. When completed, Mariemont will have a population of about 5,000. It will certainly offer an example of town planning that will possess unusual interest to city officials and community promoters.

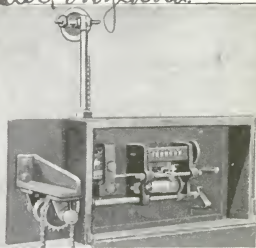
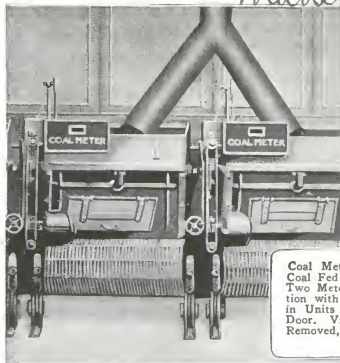


Sketch Drawn as a Suggestion for the Design of the 50 Cottages for Pensioners Who will be Supported by the Funds from an Endowment Granted by the Originator and Chief Promoter of the Community Project



Group of Buildings in the Pensioners' Section of the Town. Showing a Dwelling House, and to the Left, the Large Building with Wings, Which will be Used as a Barn, with Stables and Sheds for the Pensioners' Implements, Cattle, and Horses

Manchester, England



Coal Meter for Recording the Number of Cubic Feet of Coal Fed into the Furnace per Hour: View at Left Shows Two Meters Installed above the Fire Doors and in Connection with the Chain-Grate Stokers. The Results are Given in Units on Counting Dials behind the Slot in the Meter Door. View to the Right Shows the Meter with Its Door Removed, Exposing the Main Driving Shaft, the Spiral Drum, and the Counting Dials

COAL METER RECORDS AMOUNT

8234 OF FUEL USED PER HOUR

For attachment to chain-grate stokers of boilers, and actuated by the stoker itself, a coal meter that records continuously the cubic feet of coal consumed, has been installed in several of the largest power plants in England. The fundamental principle of the meter is the establishment of an orifice for the coal of known area in square feet, calculated by multiplying the width of the stoker chain by the height of the opening under the fire door. This is then multiplied by the velocity at which the grate moves in feet per hour. In the meter, this velocity is transmitted to a spirally toothed drum. A counting wheel, gearing with a spiral drum below and a counting box above, is mounted upon a drawbar directly connected to the fire door, and as this is opened or closed the counting wheel is moved across the spiral drum, which revolves it in accordance with the opening made by the height of the fire door. The consumption of coal in cubic feet is shown behind a slot in the meter.

344

COMPUTER MOUNTED ON CLAMP FOR ATTACHMENT TO DESK

Said to be more accurate than the common sliderule, a new computer with circular dial plates, set flush and rotating concentrically the one inside the other, is made so that it can be operated by one hand when mounted on an aluminum

desk clamp. A radial arm, with a fine hair line engraved on a transparent celluloid plate above the dials, is revolved and set like the slide of a sliderule, and has the advantage of a thumb lock for clamping it when set. Above the computer is mounted a magnifying glass, adjustable in any direction, that makes readings appear larger than ordinary

weight 1 1/2 lbs.



Computer Shown Mounted on Its Aluminum Desk Clamp and being Operated with the Thumb of One Hand: After being Set, the Readings are Seen through the Magnifying Glass Larger than Ordinary Typewriting

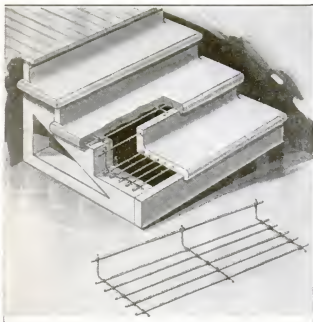
typewriting. Supplied with the computer is a leather case in which it can be packed for carrying in the pocket, after removal from the clamp.

9" diameter

*Computer Mfg. Co
\$28.50. 340 Sansome St.
San Francisco, Calif.*

REINFORCED-CONCRETE STEPS MADE IN UNITS

219 Reinforced-concrete steps are now being manufactured in units that may be



Reinforced-Concrete Steps Which are Manufactured in Units, Showing How the Round Iron Rods are Placed in the Product

joined in such a manner as to present an appearance of a solid flight of stairs when completed. Each unit consists of a tread and the riser above it. The steps are reinforced by $\frac{1}{4}$ -inch round iron rods, and while constructed strong enough to meet any ordinary requirements, are so light that they may be easily handled by two men. A gritty granite surface is used which makes them practically slip-proof and, at the same time, a careful curing process renders them sufficiently hard to resist abrasion, thus giving the product additional wearing qualities.

CANADA RESERVES MORE AREAS FOR PUBLIC SHOOTING

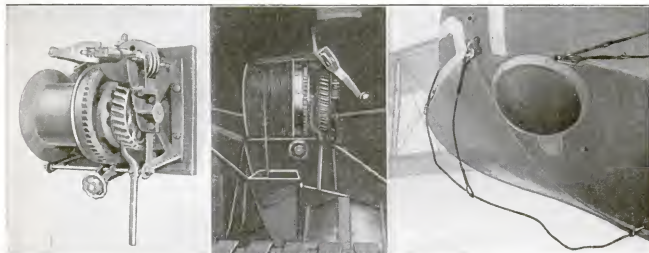
498 The action of the authorities of the provinces of Manitoba, Saskatchewan, and Alberta in recently granting approval to the reservation of marshlands and other breeding points for migratory birds, for public shooting areas, is particularly important. It not only provides hunting grounds during the open seasons, but also affords protection to the birds during the nesting season on one of the principal breeding grounds on the North American continent. The idea is to preserve natural conditions and increase the underbrush on these areas as much as possible in the next few years.

NAVY AIRMEN EXPERIMENTING WITH NEW EQUIPMENT

896 Navy airmen are actively experimenting with new equipment for seaplanes and airships. A winch for hoisting the anchors of seaplanes is one of the latest devices tested by the Naval Air Station at Pensacola, Fla.

This anchor weighs in the neighborhood of 75 pounds. Hoisting this weight from a river or sea bed without some mechanical assistance is not an easy task. Speed in hoisting the anchor is also, at times, an essential requirement. So it was decided to experiment with a special type of winch.

Weight and space requirements, however, are very important elements in deciding on air-craft equipment. The experiments with the winch have not, as yet, convinced the naval authorities that the assistance it renders justifies the additional weight and the space it occupies.



Left: Special Winch Designed for Hoisting the Anchor of a Navy Seaplane. Center: Interior View of Navy Seaplane, Showing the Mounting of the Anchor Winch. Right: The Mushroom-Shaped Object Hugging the Body of the Seaplane, Is the 75-Pound Anchor

Com. Jno. W. Keen, Bureau of Navigation
Navy Dept., Washington, D.C.

9249 Cont. Roy C. Bennett.
1208 N. 5th St.

POPULAR MECHANICS

Philadelphia, Pa.

897



Hangar in Canton, China, Built Entirely of Bamboo, to House Four Large Seaplanes: The Poles are Notched Together, and the Framework Has a Grass Covering

BAMBOO THE ONLY ESSENTIAL IN A CHINESE BUILDING

Plenty of bamboo is about all a Chinese builder needs for any kind of construction. Recently a highly ornamental archway, surmounted by a pagodalike tower, all built entirely of bamboo, was erected over a street in Canton in honor of the leader of the Cantonese army when he visited the city. Not a nail nor a peg was used in the whole structure, the bamboo poles being tied together with strips of bark. The covering was of oil-coated paper pasted onto bamboo frames. Similar in construction is a Cantonese hangar built to house four large seaplanes. This hangar has gone through two or three fairly severe storms without damage.



Bamboo Archway and Tower over a Street in Canton: There Is Not a Nail Nor a Peg in the Entire Structure. The Covering Is of Oiled Paper.

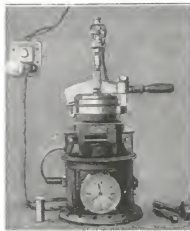
COMPUTING GASOLINE PUMP FOR SERVICE STATIONS

Computing scales that show the money value of any given weight have for some time been in use in all kinds of provision stores, and now the same idea is being carried out in selling gasoline at automobile - service stations. A dial on a gasoline pump, that has a capacity of 5 gallons, is graduated in gallons and fractions of gallons. Radially in line with these, other graduations at each fractional point show the money values of the various measurements. These are on a separate inside dial which is graduated for a certain price per gallon. As the price changes, this dial is changed accordingly.



NEW ELECTRIC VULCANIZER FOR THE DENTIST

Dentists should be interested to learn that there is now available to them a new electric vulcanizer which



scientifically and automatically times the exposure of a plate to the heat. The device is operated from the ordinary service current. With this appliance, the dentist is enabled to

work freely with his expensive material without any fear that it may be ruined by the fault of overtiming the vulcanizing process, thus adding to the general efficiency of his work.

The Buffalo Dental
Mfr. Co. 587 Main St.
Buffalo, N.Y.

The new electric Marion
522
Taylor Bldg.
Dumbelly, Ky.

William Dixon, dyer
32 E. Kinney St.
Newark, N.J.

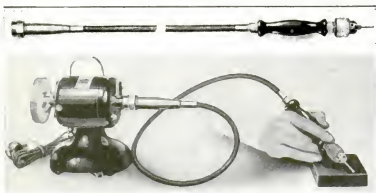
898

POPULAR MECHANICS

NEW FLEXIBLE-SHAFT OUTFIT FOR JEWELERS

A new flexible-shaft outfit has been designed specially for the use of the manu-

facturing jeweler and silversmith, but equally adaptable for die sinking and drilling in tool shops. It operates with a $\frac{1}{10}$ -horsepower motor, having speeds of from 2,000 to 10,000 revolutions per minute. The motor will run on either direct or alternating current, taken from any electric-light socket. Connected to the motor is a flexible cable with an interchangeable chuck for holding the required tool. At the other side of the motor, on its shaft, provision is made for various kinds of grinding wheels. The assembled weight is $10\frac{1}{2}$ pounds.



Jewelers' and Die Sinks' Flexible-Shaft Outfit with Light Sheath and Cable: The Handle Chuck Has a Capacity up to One-Eighth Inch. A Heavy Sheath and Cable is Shown Above

291 STEEL TUBING FOR LIGHTING COMES ALREADY WIRED

Store owners who desire an effective system of display lighting for their win-

dows now may avail themselves of an improvement along this line, that has many merits. The fixture consists of square steel tubing which comes completely wired. After the dimensions of the windows are taken and the spacing of the outlets, or lamps, agreed upon, the storekeeper, or the electrical contractor doing the work, merely sends these details to the company that manufactures the tubing. When the tubing arrives, all that is necessary is the placing of a few screws in the hangers and the connection of the wires extending from the end to the main circuits of the building. Thus the merchant is enabled to obtain, at low cost, a complete equipment.



Steel Tubing for Window-Display Lighting, Showing the Strap Hangers, Which, besides Connecting the Wires to the Mains, Are All That is Needed to Complete the Work

ANCIENT CHINESE GAME NOW FAD IN AMERICA

An ancient Chinese game dating back to the time of Confucius but only recently introduced here after the translation of its rules into English, seems to be becoming the fad of the hour in America. The game has been likened to a "glorified game of rummy" and is played with ivory tiles, with picturesque trimmings in the form of dragons, the four winds, flowers, birds, and other characters. Many leading stores are exhibiting the game sets in their display windows amid Oriental decorations. Some sets are selling for about \$15; others are higher-priced.

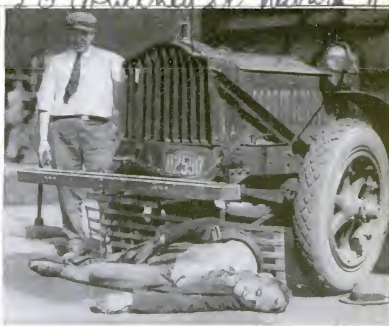


The Tiles and Other Parts of the Game in the Illustration All Have Picturesque Names. When Not in Use, the Set is Placed in a Box, as Shown Above

Max-Jong Sales Co. of America
112 Market St.
San Francisco Calif.

Pittsburgh Reflector
of the
Barnum & Bailey Co.
Pittsburgh, Pa.
356
Joe Joseph Babcock

The Safety Appliance Co.
38-40 Clinton St. Newark N.J.
387
Geo. Reichert Jr.
Reichardt & Anderson
POPULAR MECHANICS
23 Whitney St. Newark N.J.
899



Left: Self-Acting Automobile Bumper Installed on a Motor Truck, Showing How the Lattice-work Gate Drops When Pressure is Exerted against the Bumper Rod. Right: Another View of the Apparatus, Demonstrating How the Gate Prevents the Body from being Crushed by the Truck Wheels

**SELF-ACTING AUTO BUMPER
 ALSO "KILLS" ENGINE**

**ARRANGE ALL POULTRY FEED
 ON CONVENIENT STAND**

Indignant pedestrians may now experience a slight satisfaction in automatically "killing" the engine of a motor car which has rudely given them unsought impetus when they were crossing the street; that is, providing the car has been fitted with the latest automatic bumper. This innovation consists of an iron latticework gate, or fender, which is fastened behind a bumper rod and which is released when pressure is exerted against the rod. The pressure is furnished by the unsuspecting foot traveler. The impact of his body against the bumper rod causes the fender to drop to within about two inches of the pavement, thus keeping the body away from the wheels, while at the same time an auxiliary ignition switch is opened, which immediately stops the engine.

All the usual poultry feed is conveniently provided for in a new poultry feeder which consists of a galvanized-iron stand with three small troughs at the top for grit, oyster shell, and charcoal, beneath which extends a larger one for dry mash, while a few inches from the ground is another for wet mash. About midway

**LIGNITE FUEL CARBONIZED
 AT REDUCED COST**

In the course of lignite investigations conducted by the Bureau of Mines, coöperating with the University of North Dakota, two carloads of lignite were recently carbonized at a rate of 10 tons per day and at an approximate cost of \$5.50 per ton. A similar residue was produced at a cost of approximately \$6.25 per ton in the furnace used in the experiments conducted during the summer of 1921. Large reserves of this low-grade fuel await utilization.



The Top Rack of This Feed Holder Provides for Grit, Oyster Shell, and Charcoal. The Center Trough Is for Dry Mash; the Lower One for Wet Mash

from the ground to the top, at the height of the middle trough, is a wooden rail to which the chickens can hop. The trough at this level has a pair of hinged lids so that it can be closed when desired. The bottom container is made revolvable to facilitate cleaning.

U. S. Bureau of
Mines, Washington
U. C.

Jno. C. Hostler, Box 24, Altamira, Pa.
Ans.

STRANGE "PIPE ORGAN" HEARD ON STONE MOUNTAIN

361

A giant "pipe organ," with a strange medley of notes, is formed by the long



When the Wind Plays through the Small Slits in the Posts of This Fence That Guards a 1,000-Foot Bluff, Strange Music is Heard

barbed-wire fence that guards the 1,000-foot bluff at the summit of Stone Mountain, near Atlanta, Ga. The hollow iron posts supporting the wires of the fence have in them slits of about half an inch on the side facing the bluff. These form a series of whistles when struck by the wind. And as the slits are at varying heights and every shift of the wind includes a new group of posts, a weird, ever-changing sound is produced. The fence was ordered built after several persons had fallen to the rocks, nearly 1,000 feet below.

On the side of the bluff, Gutzon Borglum, the American sculptor, is now engaged in cutting the mammoth memorial to the southern Confederacy, the plans for which were described and illustrated in the Popular Mechanics Magazine for April, 1916. Beginning about 50 feet from the small shack shown in the accompanying picture, a series of stairways lead down the almost perpendicular cliff for a distance of 350 feet to a platform on which the workmen engaged in cutting the memorial stand.

LARGE OIL TANKS ERECTED IN NEW ZEALAND



Engine Room and Boiler House of Station Which Pumps Oil through a 12-Inch Pipe Line from the Wharf to the Tanks

Two oil tanks, each having a capacity of 2,000,000 gallons, together with a third which holds 70,000 gallons, have recently been erected at Miramar, Wellington, New Zealand. The larger containers are 150 feet in diameter and 30 feet in height. Each tank is surrounded by a bank, or wall, so that in event of a fire,

the burning oil will be prevented from flowing over the adjacent territory. In addition, the entire installation is protected by a fire-extinguishing system that effectually smothers any flame by the use of chemicals which, produc-



General View, Showing the Pumping Station in the Foreground, and in the Background, Two Completed Tanks and a Third in Process of Construction

ing a foamlike substance, spread rapidly over the blazing liquid.

*Owners - Vacuum Oil Co.
Miramar, Wellington, New Zealand.*

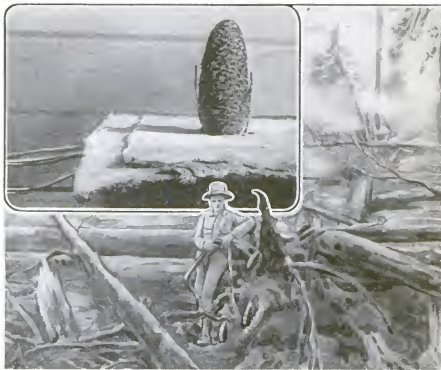
HOW TREE SEEDS LIVE THROUGH FOREST FIRES

By W. I. HUTCHINSON

AFTER eight years of scientific research, Dr. J. V. Hofmann, director of the Wind River Forest Experiment Station, at Stabler, Wash., has discovered a way of reforestation of cut-over timberlands without the expense of artificial planting. Entirely new methods of investigation were used, which sought to solve the problem of how much heat coniferous seed, particularly of Douglas fir, will stand without loss of vitality. The results obtained prove conclusively, it is claimed, that the elimination of repeated forest fires is practically all that is necessary in most cases to secure a new forest.

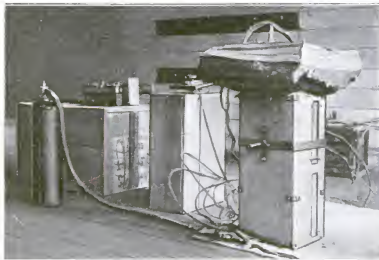
The foresters of the Wind River Station found that great quantities of tree seed, chiefly of Douglas fir which retain their vitality for many years, are stored in the moss and duff of the forest floor. Where lumbering operations open the dense stand and permit the sunlight to penetrate to the ground, a new crop of little trees is almost sure to spring up. But should a forest fire sweep over the area and destroy the little seedlings and

936 7 21
Washington, D. C.
nature, unassisted is forever lost, and planting by hand is the only method by which the land can then be restocked.



Insert: Test Cone Arranged for Determining Temperatures That Destroy Vitality of Seed. Below: In the Wake of a Forest Fire at a Point Where Thermocouples were Located to Measure Temperatures Existing at the Time the Fire was Passing through There

Through a series of tests made under conditions similar to those on commercial logging operations in the Pacific Northwest, Doctor Hofmann first determined the heat intensity of forest fires. For this purpose an instrument known as a potentiometer, which measures electric energy, was used in conjunction with thermocouples, or short loops of fine wire made out of two metals, which react to the influence of heat. These thermocouples were placed in the path of real forest fires, and connected by means of long wires to the potentiometers. The flames acting on the metal loops set up an electric current that was recorded on graduated dials. With these instruments it was found that forest fires range in heat intensity from 900 to 1,500° F. Also, that such high temperatures are of short duration, since the dry and green tops of trees—which always produce the greatest heat in a fire—burn out in from 15 to 60 seconds.



Apparatus for Temperature Tests on Seed Cones: It Includes an Electric Hot-Plate Heating Device in Which the Cones are Placed, a Potentiometer, a Rheostat, Switches, and a Gas-Supply Cylinder for Testing the Inflammability of Materials

also the few trees that are left, the possibility of the renewal of the forest by

After measuring the heat produced by different kinds of fires, the next step was

to determine accurately the temperatures that destroy the vitality of coniferous seed. In these tests the same instruments were again brought into play. A large number of unopened Douglas-fir and other tree cones were used, and the desired experimental temperatures were obtained by means of a special heating apparatus equipped with electric plates. Each cone was mounted on an asbestos base, and loops of the thermocouple wires placed one on each side of the cone, with a third wire loop running up through its center. The cone was then subjected to the various degrees of heat generated by forest fires, after which the seeds were removed from the cone and tested between wet blotters and in damp earth, to find out what temperatures were necessary to kill the seeds.

These experiments proved that the seeds in an unopened coniferous-tree cone would stand no less than 1,100° F. for periods of from 5 to 8 minutes without losing their vitality completely. While such high temperatures are common even in small forest fires, they last only for much shorter periods, so that it actually takes a fierce fire to damage the seeds inside a cone so that they will not sprout and grow. It was also found that all seeds that fall to the forest floor from cones that ripen on the trees, are almost entirely consumed by even light ground fires; but that the seeds that are buried deep in the litter and duff are little affected by such fires.

These experiments prove, Doctor Hofmann claims, that in the northwestern forests all that is needed to bring back a second growth of timber is to control fires. In logging operations, brush and debris resulting from cutting must be burned when the woods are damp, in order to protect the stored seed, which is the most important factor in perpetuating the forest. But care must be taken to prevent a second fire from sweeping over

the land. If this is done, natural reforestation will follow with no outlay of money other than the amount usually spent for effective forest protection.

The importance of this discovery can be more fully appreciated when it is con-



Second-Growth Douglas-Fir Trees Coming Up in a Tract on Which the Timber Was Once Destroyed by Forest Fires: Investigation has Shown That the Trees will Reproduce Naturally If Fires are Later Kept from Reburning the Area

sidered that 50 per cent of the remaining timber in the United States lies in the three Pacific-coast states of Washington, Oregon, and California; that we are cutting our timber more than four times as fast as it is being grown, and that there are, today, 81,000,000 acres of waste forest land that should be

growing trees. The solution of the nation's forestry problem, foresters state, lies in preventing fires and in giving nature a chance to reclothe the timberlands.

53/

TO RESTORE MONROE HOME, NOW RAG-SORTING SHOP

An old battered-looking house in downtown New York, once the home of James Monroe, fifth president of the United States, and now being used as a junk and rag-sorting shop, is soon to be restored by the Sulgrave Institution. This society, which was organized to promote good feeling between English-speaking peoples, intends raising a fund to buy the building so that it can be dedicated on Dec. 2, 1923, the 100th anniversary of the signing of the Monroe Doctrine. The house, a two-story brick in Colonial style, stands at Prince and Lafayette streets, in what at one time was the most fashionable residential neighborhood in the city.

Christian Science Monitor

Without including government ships being built for the U. S. Shipping Board, American shipyards, on Sept. 1, 1922, were building, or were under contract to build, for private owners, 131 steel vessels of 249,394 gross tons. Thirteen new contracts were let, and two vessels were completed, during the month of August.



HIGH-PRESSURE PUMPS FOR NEW YORK FIREBOATS

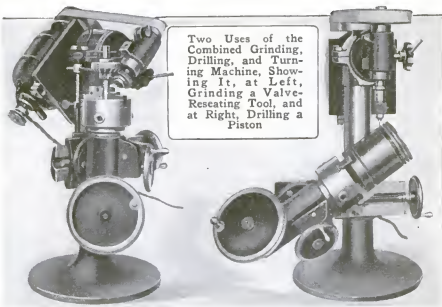
NEW high-pressure pumps were recently tested on the fireboat "James Duane," belonging to the New York Fire Department. These pumps have a capacity of 9,800 gallons per minute, and from the hose nozzles they throw a stream of water to an exceptionally great distance. The tests were perfectly satisfactory. Eventually all the fireboats of the department will be equipped with these new pumps.

7700 Combination

THREE MACHINE TOOLS IN ONE FOR SMALL REPAIR WORK

One self-contained machine, that stands only 24 inches high and weighs altogether only 135 pounds, has a combination of operating mechanisms that enable it to do almost any kind of grinding, many kinds of drilling, and some forms of turning, thus making it a tool that alone will do most of the work required in a motor-repair shop or a garage. It has an upper spindle that is in direct connection with its $\frac{1}{4}$ -horsepower motor, by which it is belt-driven, and which can be set to operate at any angle. This carries the various grinding wheels, but these can be replaced by a drill chuck, making many small drilling or milling operations possible. The lower spindle, which can also be set at any de-

sired angle, is driven from a small grooved pulley on a shaft extension at the lower end of the motor through a double idler pulley hooked to a spring on an adjustable shaft, giving suitable belt tension in



Two Uses of the Combined Grinding, Drilling, and Turning Machine, Showing It, at Left, Grinding a Valve-Reseating Tool, and at Right, Drilling a Piston

any position. A lug on the upper spindle holds a cutting tool for small turning operations on work on the lower spindle.

any position. A lug on the upper spindle holds a cutting tool for small turning operations on work on the lower spindle.

Ex. Cell. O Tool + 1144 St. Detroit Mich
12 14 Decambien

TIME-KEEPING IN DECIMALS FOR FIGURING PAYROLLS

For making time calculations by the decimal system, instead of by the much more complicated hour-and-minute system, the dials of all the clocks in a large factory have been divided into 10 six-minute periods, shown with figures alongside the conventional 12 five-minute subdivisions. Thus the hours remain



the same, but any fraction of an hour can be read in decimals. For instance, when the time reads 18 minutes past 9, the decimal figures show it to be 9.3, in which manner it is recorded for making payroll calculations.

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432 NEW LIGHTWEIGHT PISTONS WITH CURBED EXPANSION

In lightweight pistons made of any aluminum alloy, trouble may occur from the excessive expansion characteristic of this metal. This means that in these pistons a greater clearance has had to be allowed between the piston and cylinder than with iron pistons. A lightweight piston, recently patented, has been designed that takes care of this



trouble by cutting vertical slots, on opposite sides of the piston wall, extending from the bottom piston ring to the end of the skirt. Two continuous steel bands of smaller diameter than the piston are cast in it, one above the wristpin boss, and the other at the bottom of the skirt. These control the expansion of the piston so that it is said to be actually less than that of the cylinder, with the result that

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there is greater clearance in a heated engine than in a cool one, permitting adequate lubrication when it is most needed.

904 COLLAPSIBLE TABLE HANDY FOR CAMP OR PICNIC

Campers and picnickers will welcome a handy collapsible table which may be folded into a box, 10 by 12 by 36 inches



in size, so that it can be easily carried on the running board of an automobile. It weighs less than 25 pounds. When opened, three sides of the box form a top surface of 33 by 36 inches, while above this, an

adjustable shelf can be mounted to accommodate extra dishes. Four legs give the table proper stability. Besides ample space for knives, forks, and small cooking utensils, the outfit includes a screened inclosure in which food may be stored, safeguarded against animals and insects.

375 DEMURRAGE CALCULATOR USED LIKE A SLIDERULE

In the nature of a sliderule, a demurrage calculator that is now in use can be set to show at one reading the number of days' demurrage on a car, with the amount due. It has both a straight-demurrage and an average agreement-demurrage table, and it enables the operator to deduct Sundays and all legal holidays in accordance with either system. The slide is tabulated for 12 months, six on one side and six on the other. Only three months show through the opening



Calculator That, by Adjustment of Its Slide, Shows at One Reading the Number of Days' Demurrage on a Car, with the Amount Due

in the face of the calculator, and succeeding periods of three months are shown by reversing the ends of the slide.

Ans. John W. Worman,
Marion, Ill.

Butler Mfg. Co. 3234 W. Washington St.
Indianapolis, Ind.

9903 *Ans. Harry Es Ainsworth,
Kentland, Ind.*

ELECTRICAL DEVICE OPERATES GARAGE DOORS



Automobile Approaching a Garage Entrance, and Opening the Door by the Action of a Plate Pressed Down by the Weight of the Car



Two Cars have Entered the Garage Simultaneously, Each Opening the Folding Doors by Passing over a Plate in the Driveway



Interior of the Garage, Showing, Suspended from the Ceiling, Two Motors and Housings for the Gears That Operate a System of Levers for Opening the Doors: The Control Switches Are Inside the Garage

An electrical means of opening and closing garage doors, recently patented, consists of a small motor installed by the side of a housing, both being suspended from the ceiling of the garage at some distance from the doors. Inside the housing are gears that operate a system of levers which open or close the doors when the motor is run-

ning. The motor is controlled by a switch inside the garage. Outside the garage, on the roadway in front of the door, is a plate which, when pushed down by the weight of an entering car, operates a switch that throws on the current. A strong spring prevents the switch from operating by any weight less than that of a car.

107 NEAT OVERALL SUIT MADE IN TWO PIECES

An overall suit which has no bibs, strings, suspenders, double folds, or buckles, is now available. The outfit, consisting of a jacket and trousers, can be fastened together with buttons and put on or taken off as a one-piece garment if desired. Under the waistband of the jacket are tabs which are buttoned to the trousers, thus forming a close and neat-fitting connection and making the garment practically dust-proof. The two parts of the suit may be washed separately, and, owing to the absence of buckles to rust or elastics to rot, are claimed to be very durable. Due to its design, the wearer is permitted unusual freedom of action.



Left: Neat-Fitting Overall Suit, Shown in Full-Length. Center: Jacket of Suit, Displaying the Flaps under the Waistband. Right: Trousers of Suit, Showing Buttons Which Fasten into the Flaps

*Caddy Over-Suit Mfg. Co.
Victor Bldg. Kansas City, Mo.*

Mr. Frost, Coventry, England.

906

POPULAR MECHANICS

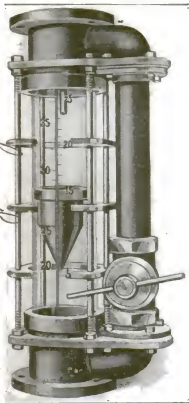
305

DIRECT-READING INSTRUMENT MEASURES FLOW OF FLUIDS

A European manufacturer has brought out something new in the way of a meter for measuring and regulating the flow of

gases and liquids either at atmospheric or higher pressure. The fluid passes upward through a tapered orifice at the bottom of a vertical glass tube, and raises a float to a height which is proportional to the flow. Graduations on the outside of the glass tube indicate the rate of flow. The accuracy of the instrument is largely due to the construction of the

float, which is kept in rotation and prevented from touching the walls of the tube by the action of the fluid, thereby reducing friction to a minimum. It can be made in a wide range of sizes, and because of its sensitive and instantaneous operation, is adaptable to laboratory work as well as to commercial purposes.

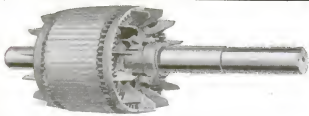


Emb. Major Johnstone Taylor, The Bungalow, Underdale, Shrewsbury, England.

306

BLOWERS ON ARMATURE KEEP MOTORS CLEAN AND COOL

When electric motors are used in locations where there exists dust or refuse of any kind, they have to be carefully inclosed to keep the working parts clean. A motor is now made for use under such



Armature with Projecting Fan Blades at Each End That Act as Blowers, and Expel Dirt or Dust through Openings in the Frame of the Motor

Wagner Electric Co. St. Louis, Mo.

conditions which, instead of being inclosed, has special openings in its frame through which dust, or any foreign substance, is blown out. A number of small projecting fan blades are connected to each end of the armature. These form blowers that immediately expel through the openings in the frame any foreign substance that gets inside it. This method of keeping the parts clean has the advantage of also keeping them from overheating by the constant current of cool air.

477

SEA LIONS SHOT FROM BOAT CARRYING MACHINE GUN

Off the northwestern coast of British Columbia a machine-gun veteran of the late war has utilized the skill he acquired in this occupation by helping to kill 220 sea lions. He was one of a party sent north for the purpose by the government fisheries, because the sea lions destroy the nets. The firing was done from small boats, lying to leeward of schools of these animals, the men using one machine gun as well as ordinary shotguns. Sea lions have surprising vitality, and as a rule it took several shots to kill one.

Emb. Frank B. Hicke, General Post Office, Canada.

TANKS HOLDING 1,000 GALLONS

399 WATER LARGE VASES

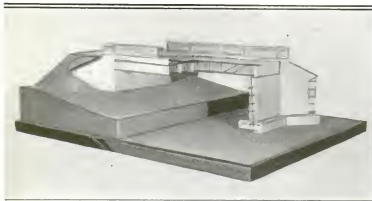
While it may sound like an exaggeration to say that flower vases exist which require 1,000-gallon water tanks to sup-



One of the Big Vases Placed along a California Highway for Advertising Purposes: Each is Watered from an Individual Storage Tank

ply moisture to each one, the statement is literally true. The vases, 12 feet in height, are placed along a California highway for advertising purposes. Beside each of them a big water tank has been built, and a siphon arranged leading into the vase. At frequent intervals an attendant waters the plants.

Emb. Frank B. Howe, Mason Opera House, 412, Los Angeles, Calif.



Miniature Reproduction of a Concrete Highway Bridge, the Vertical Section of Which is Designed in the Shape of the Letter "T"

410

TWO OLD LIGHTHOUSES USED IN BUILDING COTTAGE

Two lighthouses were used in the construction of a cottage, recently built,



The Tower Wings of This House Were the Base Sections of Two Condemned Lighthouses Which the Owner Was Able to Buy for a Small Sum

overlooking the ocean near North Eastham, on Cape Cod, Mass. The encroachment of the sea had made it necessary for the government to condemn the two old lighthouses in favor of another more se-

ways that best suited to local conditions. Of the various types, earth, sand-clay, and gravel constitute about 66 per cent; cement, brick, and bituminous concrete, 24 per cent, and other types the remaining 10 per cent, of all highways built in the United States. It is thus evident the majority of our highways is not of the so-called improved type, and that for some time to come the dirt and gravel roads will continue to be the solution of the road problem.

curely located. Hearing of this, a resident of the cape bought them for a small sum, moved them back, and used the base sections as tower wings for his residence.

349

SHOCK LOADER ECONOMICAL FOR THE FARMER

Time and labor may be saved by the farmer if he makes use of a recently developed grain or hay loader which has been given practical working tests. The outfit is constructed entirely of iron and steel. An elevating carrier frame extends upward and around a 45° curve at a sufficient height to overhang the ordinary wagon containing a rack. The implement is hauled by a team of horses. In operation, the rake mechanism automatically picks up the shocks of grain, or the hay, which lie in its path and deposits them on the rack wagon which is driven alongside. The farmer is thus enabled to reduce his expenses considerably during the harvest season and at the same time to take care of his crop in the proper manner.



Left: Loading Machine, Showing How the Implement Picks the Shocks of Grain or Hay from the Ground and Carries Them up the Incline for Deposition on the Wagon Which is Driven Alongside. Right: Rear View of the Loading Machine, Clearly Illustrating the 45° Curve in the Carrier

Albertson Loader Co 844 Seal St.
St. Paul, Minn.

Harold A. Blanchard
Lynchburg, N.Y.



Interior of a Box Car Converted into a Classroom in the Yards of the Atlantic Coast Line Railroad at Lakeland, Florida: The Class is Composed of Mechanics from the Railroad Shops, Who Made the Desks and Stools, and Fitted Up the Classroom to Serve Its Purpose Effectively

365 RAILWAY BOX CAR CONVERTED INTO A HANDY CLASSROOM

A number of ambitious mechanics employed in the Atlantic Coast Line Railroad shops at Lakeland, Fla., were anxious to study mechanical drawing, blueprint reading, mathematics, and the rules of the American Railway Association. They were numerous enough to form a class, but nothing in the nature of a classroom was available. So it occurred to them to appeal to the company for the loan of a box car. The request was granted, and they mounted the car on blocks in the yard. The doors were filled in, windows were installed in the side walls, and a doorway at one end. At the other end a blackboard was placed on the wall. The men made their own desks and stools in the shops. The interior was painted a light and attractive color and electric lights were installed.

357

LARGE NUMBER ON AUTO BUS SERVES NOVEL PURPOSE

Maintaining that the good will of the public is its largest stock in trade, an intercity motor-bus company of California has painted large numbers on the baggage rack of its busses and invited

the public to report any breach of the unwritten "laws of the road." The drivers are all good men, says the company, but the knowledge that every motorist is



The Large Number Makes It Easy for Other Motorists to Identify the Bus When Reporting Discourtesy or Careless Driving

watching a big No. 18 or No. 12, makes them just a bit more anxious to please. The numbers are about 2 feet high.

W. R. Curtis, Santa Rosa - Sausalito
Stage Co., San Francisco, Calif.

4773 Emb. Rufus E. Steering
458 3017 Prospect an
POPULAR MECHANICS
Kansas City, Mo

910



Speedway Recently Erected and Dedicated at Kansas City, Missouri, and Which has been Declared the Fastest Track
ramic Picture, Taken from the Grand Stand, Shows a Number of the Speeding Machines Bunched
Private Cars, Parked While the Owners Watched the Event, Together with the

MAGAZINE STOVE WILL BURN

SAWDUST FOR FUEL

The ever-increasing cost of coal has led to the development of a heating stove that will burn sawdust or the lower grades



Left: Magazine Stove Which Burns Sawdust or Lower Grades of Coal. Right: Magazine of Stove, Showing the Removable Core

of coal that are unsuited for use in the ordinary stoves. There is a separate magazine inside the drum of the stove, and this can be taken out and packed with fuel. A removable core is placed in the magazine before the fuel is packed in, and is withdrawn when the magazine is replaced in the stove. The space occupied by this core forms a central draft opening through the bed of fuel, and insures good combustion. The magazine is adjustable by a lever which varies its distance above the grate.

ITALY TO DRAIN MARSHLAND

UNUSED FOR 2,500 YEARS

Along the Appian Way from Rome to Naples, between the Lepini Mountains and the Tyrrhenian Sea, lie the Pontine Marshes. Although numerous plans have been advanced to reclaim these lands, since the canals and ditches of the Volsci were destroyed during the 150 years' war of the Roman conquest, they have never been realized. At the present time Italy is actively engaged in making productive over 6,000 acres of this area, and the complete project calls for the construction of a large reservoir to catch the drainage from the mountains, which will be used for irrigation during the dry season and to supply power for pumping when there would otherwise be an excess of water on the land.

La nature 8/5/22 P38

WORLD'S FASTEST SPEEDWAY

STAGES FIRST EVENT

"The fastest track in the world!" declared Tommy Milton, winner of the automobile classic at Kansas City, Mo., as he clambered out of his overheated and steaming racer, after traveling the 300 miles at a rate of 108 miles an hour. Other nationally known drivers voiced practically the same opinion of this new speedway. Built of wooden planks, which are laid on edge and end to end, the 1¼-mile track is properly banked at the turns to assure apparent safety to the dare-devil drivers who risk their lives for the large money prizes. Nevertheless, during the dedication race on Sep-

Pyro Mfg. Co. 72 W. Washington Chicago



C. ANDERSON

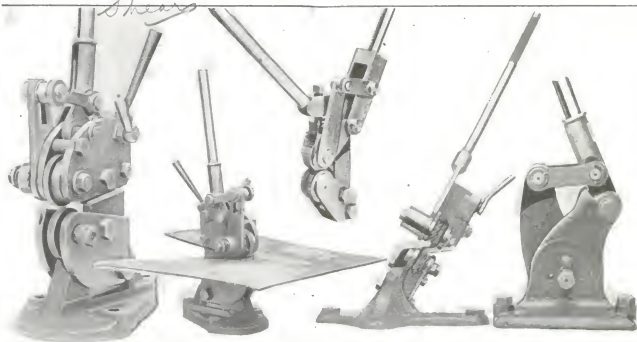
in the World by Tommy Milton, Winner of the Dedication Race, and Other Well-Known Racing Drivers: This Panorama at the Steeply Banked Turn at the Right. In the Track Inclosure may be Seen the Thousands of Numerous Garages for the Racers, and in the Background the Large Bleachers

tember 17, one man was killed and eight injured. Of 16 entries, only eight finished. The grand stand, erected at a cost of \$350,000 and seating 17,000 persons, was filled to overflowing, it being estimated that 56,000 spectators crowded into the grounds to see the event.

NEW MACHINES FOR CUTTING METAL SHEETS

Sheet-metal workers will be interested in several new shop tools that are being introduced by an English manufacturer. Each one is provided with rotary cutters

operated through a ratchet by means of a powerful leverage, and as there are practically no throat restrictions, sheets of any commercial size can be successfully cut. One is built solely for straight cuts on flat sheets; another, intended for cutting curves or figures of irregular outline, has the overlapping cutters set at an angle to the sheet; a third machine is designed for particularly heavy work and has a pair of rotary double-edged cutters, the upper one of which is driven by an internal ratchet by means of the forked handle. The latter is well adapted to the shearing of corrugated iron.



From Left to Right Are Sheet-Metal Shears Adapted to the Following Uses: The First Two for Straight Cuts on Flat Sheets; Cutting Flat Sheets Heavier than 20-Gauge and Corrugated Sheets; Irregular Shapes from Flat Sheets; Shearing Round or Square Rods

The Tangent Tool Engineering Co. Ltd.
Keynsham, Somerset, England

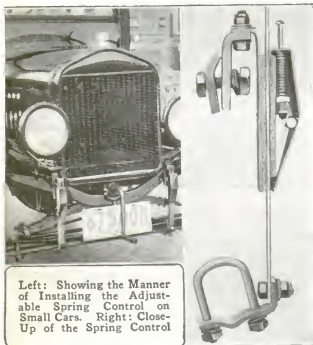
The Wellman Weber Checkers Co.
7016 Euclid Ave.

Manchester
Esquarian Weekly.
Sept. 16
1922

264⁹¹²

POPULAR MECHANICS
ADJUSTABLE SPRING CONTROL
FOR SMALL CARS

Auto
Cues
"Thank you mams," the violent bumps
that toss persons in the rear seat up
against the top of an automobile, need

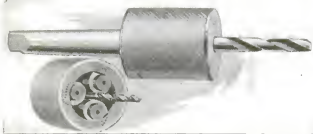


Left: Showing the Manner
of Installing the Adjust-
able Spring Control on
Small Cars. Right: Close-
Up of the Spring Control

cause no annoyance to occupants of small cars. The remedy consists of an adjustable spring control. These devices may be installed on a machine in 20 minutes and do not require the removal or change of any parts, nor the drilling of holes in the frame or body. They are attached directly to and between the body and axles. All sidesway, or the objectionable rebound, is claimed to be eliminated when traveling over the roughest roads, by means of a frictional resistance which has a "checking" effect upon the springs of the machine.

NONSLIP DRILL CHUCK
REQUIRES NO KEY

A neat and convenient chuck, adapted to the use of small and moderate-sized twist drills, has lately been offered to the



This Simple Drill Chuck Is Self-Centering. Requires No Key, and Takes Straight or Taper-Shank Drills

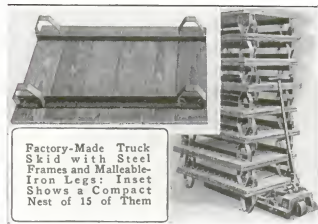
trade. It consists of three controlled cam jaws, having a journal and inclosing ring at each end, which grip the drill shank. The outside knurled surface of the ring provides a handgrip on the chuck, which is so easily operated that straight-shank drills can be changed without stopping the spindle.

RETURN FROM THE ANTARCTIC
OF THE ILL-FATED "QUEST"

On Sept. 16, 1922, just a year after the departure of the "Quest" from Plymouth, Eng., to carry out its antarctic expedition under the command of Sir Ernest Shackleton, the little vessel sailed back into that port. The death of this great explorer, January 5, on board the "Quest," was not its only visitation of ill fortune, for on the contrary it seemed to be pursued by bad luck from the beginning of its 25,000-mile cruise to its end. Unfavorable weather attended it all the way, and when the antarctic was reached, there were encountered exceptionally unfavorable ice conditions. Nevertheless, Commander Wild states that scientific results of great importance were obtained.

FACTORY-MADE TRUCK SKIDS
ARE STRONG AND DURABLE

Homemade truck skids may be replaced to advantage with a skid manufactured with a steel frame and malleable-iron legs, the whole installation being strong and



Factory-Made Truck Skid with Steel Frames and Malleable-Iron Legs: Inset Shows a Compact Nest of 15 of Them

durable. The frame is made of 2½ by 2 by ¾-inch steel angles, upon which heavy planking is bolted. Riveted to the frames are four rigid legs, made of malleable iron, 1½ inch wide and ¼ inch thick. The legs are properly located for using the skid to best advantage with lift trucks and otherwise.

Cowan Truck Co.
7 Water, Holyoke, Mass.

Eastern Tube & Tool Co. Inc.
594 Johnson Ave., Brooklyn, N.Y.

9/15/22

832

POPULAR MECHANICS

913

Forest Products Laboratory Madison, Wis.
POISONS MIXED IN PARAFFIN GOLF BALLS TESTED BY MEANS
AS WOOD PRESERVATIVE 973 OF DRIVING MACHINE

Discovery of a new wood preservative, consisting of a mixture of soluble poisons and liquid paraffin, has just been announced by the Smithsonian Institution. The poisons used in the experiments thus far are iodide of arsenic and iodide of copper. As is well known, arsenic is deadly to all animal organisms, while the effectiveness of copper salts for the destruction of plant life is equally common knowledge. It is therefore apparent that organisms attacking wood which has been treated with this mixture will virtually commit suicide. Specimens of piling, after receiving the paraffin treatment, have been submerged for some time by the side of untreated specimens, at Key West, Fla. While the untreated piles show clear evidence of the destructive work of the teredos, or marine borers, those treated with the new solution are in as good condition as when they were placed in the water. It is thought that this treatment would also be efficient for wood used in seaplanes, because it would prevent moisture from penetrating the joints and causing them to become weakened.

TINY GUN EASILY CONCEALED 37 IN PALM OF HAND

One of the many strange exhibits at the recent police convention in New York City, and one which attracted considerable attention, was a tiny gun of peculiar make. It was so small that it could be easily concealed in the palm of the hand. With this miniature but deadly weapon, 12 shots may be fired with great rapidity, and it is thought that there are few guns of this kind in existence.



no information on maker

In England a mechanical device is used for testing golf balls. The club is at-



The Above Machine has been Designed to Test Golf Balls under Conditions to Which They are Subjected in Actual Play. The Length and Force of Stroke Are Adjustable

tached to the machine and adjusted to give the desired swing and timing according to the variations of the human stroke. The force and length of the stroke are thus measured, and the different factors entering into the manufacture of the balls determined, under conditions identical to which they are subjected in actual play.

GOVERNMENT OIL LANDS YIELD LARGE ROYALTIES

Under the leasing acts, which are an important innovation for the petroleum industry, the royalties obtained from government-owned lands vary from 12½ to 33½ per cent, according to the rates of production. Of the amounts received, 10 per cent goes to the Federal government, 37½ per cent to the state in which the oil is produced, and 52½ per cent to the U. S. Reclamation Service. During the fiscal year ended June 30, 1922, the total government royalty amounted to approximately \$4,000,000, and in the month of August, \$778,378.11 was turned into the U. S. Treasury in addition to the sums received by the different states and the reclamation service.

Publicity News Bureau of Mines, Washington, D.C.

Blundell, Thire & Rubber Corp. of America, 17 E. 42 nd St. New York City

name on gun - Surbines. Taken from an American criminal in prison.

Colt. Francis P. Mann.
12, Boulevard Arago.

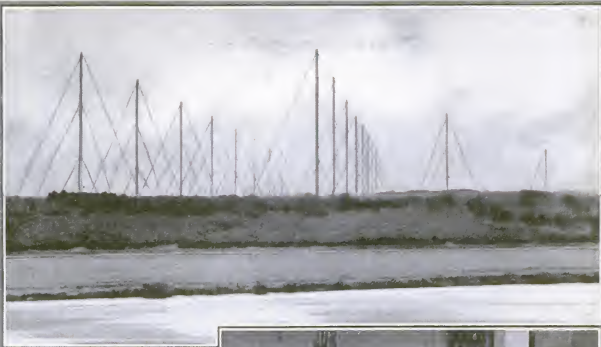
Paris, France



WIRELESS PLANT AT SAINTE-ASSISE HAS WORLD-WIDE CONNECTIONS

HAVING four times the capacity of any other in Europe, the new French radio station at Sainte-Assise, several miles from Paris, is controlled entirely from the city by means of automatic apparatus. All parts of the world are reached from the main building, shown above, while the European work is done in the smaller building, with its 800-foot tower, shown to the left. The main building contains high-frequency alternators, shown below, of special design, and with exceptional capacity.





The aerial of the plant, shown above, covers many acres of ground, and is composed of 40 miles of wire, weighing 16 tons. High-speed automatic apparatus at the Paris office, shown to the right, operates over wires to the Sainte-Assise plant. Here the receiving plant, consisting of six buildings, seen below, each containing a large movable frame coil and a set of special tuning apparatus, is located at some distance from the main plant.



Ans. W. P. Walker,
 Williams Drug Store,
 916 *Spartanburg, S.C.*

POPULAR MECHANICS

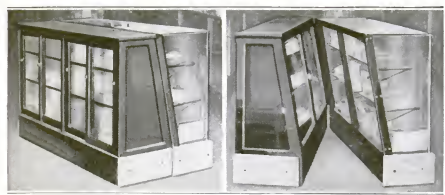
SHOWCASE IN TWO SECTIONS AIDS STOREKEEPERS

336

Storekeepers will be interested in a new showcase which appears similar to the

two sections. In the front section, the shelves and mirrors are placed so as to be in the prospective customer's line of vision as he enters the store. The rear section is a miniature stockroom. When

the buyer indicates the article in the case that he desires, the clerk merely opens a small door at the rear, directly behind the indicated merchandise, and is enabled to hand out the goods without having to disturb the display scheme, which would necessitate a rearrangement of the showcase. By this method, the exhibited merchandise always presents a neat and attractive appearance, while at the same time, the customer may be served rapidly.



At the Left the Showcase, Which is Made in Two Sections, is Seen with Both Parts Pushed Together, Making the Whole Appear as One Structure. At the Right, the Sections are Shown Separated

usual display case from the front, but differs greatly at the rear. It is made in

pearance, while at the same time, the customer may be served rapidly.

AUTO-TOP LINING WITH SPACES FOR CLOTHING

239

Auto "Upper North Co."
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TRANSMUTING THE ELEMENTS

BY ROGERS D. RUSK,

The Connellsville, Pa.

"THE artificial transmutation of the chemical elements is thus an established fact," says Prof. O. W. Richardson, in speaking of the work of Sir Ernest Rutherford, who has recently succeeded in breaking up some of the chemical elements, and has obtained traces of hydrogen from some of them. It was the dream of the alchemists of old to transmute the elements, particularly the baser metals, into gold and silver, but their aim was never attained. Probably the actual changing of lead to gold is the thought farthest from Rutherford's mind as he works in his laboratory, but his discoveries have already made the world very much richer in the knowledge of the secrets of matter which have been revealed, and the possibilities of the future. Furthermore, it is just such a beginning which often leads to the most startling achievements of science.

The scientists of today are showing that the dreams of the alchemists were not so vain and foolish as once was thought. Indeed nature has been practicing alchemy since the dawn of existence and has been continually changing matter from lower forms to higher forms and back again. Radioactivity is nothing more than the transmutation of complex atoms into simpler forms. When a complex atom grows old and begins to decay, it breaks up and throws off some of its particles in the form of rays. The remaining particles form an entirely new atom, which is lighter in weight than the old one. This process continues until the particles which remain form so stable a combination that they refuse to break up further, and then all radioactivity has ceased.

What nature has been doing spontaneously in radioactive substances Sir Ernest Rutherford has now succeeded in

doing by artificial means. For a long time after the discovery of radioactivity, scientists were only able to watch the process continue spontaneously. They could not stop or start it, nor could they change one element into an entirely different one as nature does.

Now it appears that this may be possible, though not on a very large scale nor as a commercial enterprise, perhaps. It thrills one to think that the scientist has at last been able to wave the magic wand of his

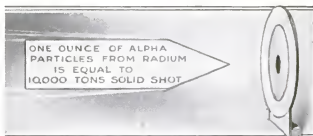
knowledge over matter of one kind and change it into an entirely different kind, even though the change can only be detected by the most sensitive means.

Rutherford's method is to subject the atoms of a substance to a bombardment of very swift-moving particles. Now the swiftest-moving particles known to science that have any appreciable weight are the "alpha" particles shot off from radium. These particles have the same weight as a helium atom, but they travel at a speed of 12,000 miles per second, and hence are endowed with a tremendous

amount of energy in comparison with their size. Rutherford calculates that an ounce of these particles would be equivalent to 10,000 tons of solid shot moving at the speed of a rifle bullet (i. e., about two-thirds of a mile per second). Small wonder that these particles, on striking ordinary atoms, cause them to break up and change their form!

In this manner phosphorus and nitrogen were found to give off hydrogen and

an unknown residue. Many other substances were tested, some with doubtful, some with negative results. The appearance of hydrogen in several cases lends support to the theory that hydrogen is one of the chief constituents of the atoms of the chemical elements, and one of the leading theories of the day is that all the



Graphic Illustration of the Fact That One Ounce of the "Alpha" Particles from Radium Is Equivalent to 10,000 Tons of Solid Shot Moving at the Speed of a Rifle Bullet



Screen of Zinc Sulphide in the Spinthariscopes: When Struck by the Alpha Particles from Radium, the Effect of Countless Flashing Stars is Produced on the Screen

*Cavendish Laboratory
Cambridge University Cambridge Eng. 1917*

atoms of all the elements are built up of hydrogen and helium atoms firmly bound together.

Rutherford's biggest problem was the detection and identification of any new particles which were produced by this process of bombardment. The new particles formed by the collisions of alpha particles and ordinary atoms were, of course, also forced by the collision to travel at very high speeds, and the distance they would travel in the air could be calculated from a knowledge of their weight and speed. Fortunately such high-speed particles have the property of making their presence known when they strike a screen of zinc sulphide. Each particle as it strikes the screen produces a little flash of light and these flashes may readily be counted with a microscope. A small bit of radium on a needle point near such a screen produces an effect like a myriad

of scintillating stars, and an instrument to make the effects of radioactivity visible is called a spinthariscopes.

The product of all radioactive changes is a substance which will not decay further, and which has been found to be the same chemically as lead. Now the weight of an atom of lead is just a little more than an atom of gold, but the radioactive processes of nature stop with the substance lead. If it were possible under a bombardment of alpha particles to make lead decay further, it would form in turn the chemical elements thallium, mercury, and then gold.

So it is that the dream of the alchemists was not so far astray after all, but it should be said for any who may still be dreaming dreams, that the world would be no better off if all the lead were turned to gold, for then everybody would be seeking a way to turn it back again.

MODELS OF SPLASH DAM AND POWER PLANT



Above: Miniature Splash Dam Built by Students of the Forestry College and Engineering Branch of the University of Washington. At the Right Is the Working Model of a Water-Power Plant, Together with a Roadway, Tunnel, Bridge, and Transmission Poles, All Made of Concrete

Working models of a logging camp and a hydroelectric power plant, together with necessary details, were recently placed on exhibition by the students of the forestry college and the engineering branch of the University of Washing-

ton. The two projects in miniature were built exactly to scale, the logging camp having an actual road, splash dam, creek, tiny pine trees, and other realistic scenery. The power plant was constructed mostly of concrete, and thoroughly demonstrated the use of this material for dams, power houses, roads, tunnels, bridges, flumes, and poles for carrying the transmission lines.



396 Limer. Fonda. Johnston &
Gloversville R. R. Co.

POPULAR MECHANICS

Gloversville N.Y.

919



One of Two Gasoline Passenger Cars in Service on the Fonda, Johnston & Gloversville Railroad: The Car is Built of Steel and is Fitted with Air Brakes, Electric Lights, and All Standard Equipment. The Four Wheels of the Front Truck are Driven by a Powerful Engine of the Automobile Type

GAS-DRIVEN RAILROAD CAR FOR PASSENGER SERVICE

One more example of the gasoline railroad cars that are becoming more and more popular is a four-wheel, double-truck car, two of which have been placed in service on the Fonda, Johnston & Gloversville Railroad. The powerful engine is of automobile type, driving similarly through a clutch and transmission. The car body is of steel, and is of modern construction, carried on two four-wheel pivoted trucks, the wheels of the front truck taking the drive. The normal speed is 35 to 40 miles with a maximum of 50 miles an hour. Each car, with a crew of two men, carries 46 passengers comfortably seated, as well as one ton of baggage. The cars run six miles per gallon of gasoline, and 400 miles per gallon of oil.

MONSTER DEMOLITION BOMB WEIGHING 4,000 POUNDS

At the ordnance-proving grounds, Aberdeen, Md., is a demolition bomb made by the U. S. Ordnance Department that is the most powerful and destructive in the world. It weighs 4,000 pounds, and would sink almost any battleship if used as similar, but much less powerful, bombs were used last year to sink battleships off the Virginia capes. At the Aberdeen

proving grounds gun tests are made annually before an assembly of the foremost American engineers.



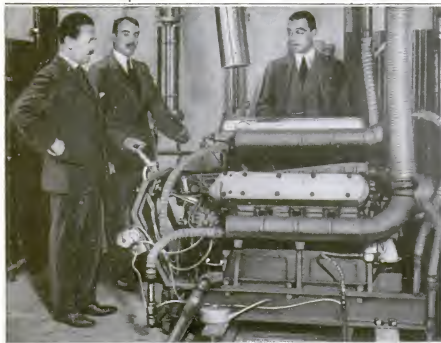
Largest and Most Powerful Demolition Bomb in the World, Made by the Ordnance Department: It Weighs 4,000 Pounds, and Dwarfs the Soldier Who is Standing beside It

Ordnance Dept. Ordnance
Proving grounds, Aberdeen Md.

Purchased from Service Motor Truck Co. of Glenside, Pa.
Bodies - J. B. Drell Co., Philadelphia, Pa.

REBUILT AIRPLANE MOTORS SYSTEMATICALLY TESTED

68 By An English manufacturer has established a system for the thorough testing



By Means of This Equipment, an English Manufacturer Systematically Tests, under Conditions Equivalent to Full Flying Speeds, Rebuilt Motors Before They are Placed in the Planes

of all rebuilt airplane engines, after they have been overhauled and before they are reassembled in the flying machines. In this way, the performance of the motor is checked for capacity and efficiency, and its reliability determined.

TESTS MADE OF ANEMOMETERS TO DETECT THEIR ERRORS

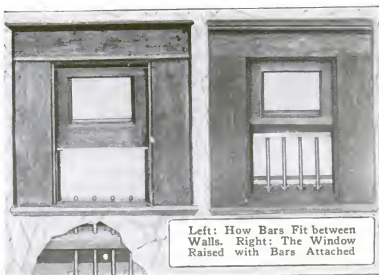
440 Experimental values of the factors or constants of anemometers throughout the range of wind velocity occurring in nature, are now available for the first time, as the result of elaborate tests made by the Weather Bureau, with the co-operation of the Bureau of Standards. About 30 of the anemometers in general use, of various dimensions, were tested in wind tunnels, and also at Mount Washington, N. H., for comparison in the very high winds prevailing there. These investigations proved that the anemometers now in use record the velocities about 22 per cent too high, and it is now intended to design an improved standard instrument that will record them correctly. The three-cup will replace the present four-cup pattern.

NEW METHOD OF CLEANING 444 GASES AND VAPORS

An improved process for removing dust, tar, and other foreign matter from gases employs a filter composed of a hollow wrought-iron ring of rectangular cross section subdivided by partitions into several compartments. Inside this, and concentric with it, is a rapidly rotating ventilator wheel, having clearance between it and the filter proper. The compartments of the filter are fitted with either organic or inorganic materials, depending upon the kind of substance to be separated. On the upper lid is a sprinkler. By the evaporation of a small portion of the washing liquid, the gas becomes more efficient, and its heating value is increased. The rotating filter is more efficient, is cheaper to install, and occupies less space than static cleaners.

NEW BURGLAR-PROOF WINDOW WITH DISAPPEARING BARS

A burglar-proof window which permits the sash to be opened to any desired height is now on the market. Protection is insured by a set of iron bars, 5 inches apart, that are raised or lowered with the



Left: How Bars Fit between Walls. Right: The Window Raised with Bars Attached

window. When the window is down, the bars are telescoped between the wall and

Wm. C. Rogers R. Handy
1409 Holmes St. Kansas City
Mo.

emb. C. J. Blanchard
3083-16th St. N. W.
Washington D.C. 921

POPULAR MECHANICS

QUEER GATE BUILT FROM BITS OF DRIFTWOOD

woodwork. Mortised and locked, at all times, to a heavy strip of metal fastened at the bottom of the sash, the window can scarcely be forced. A heavier sash weight, substituted for the ordinary weight, makes it easy to open and shut the window. The bars can be disconnected from the inside, if desired.

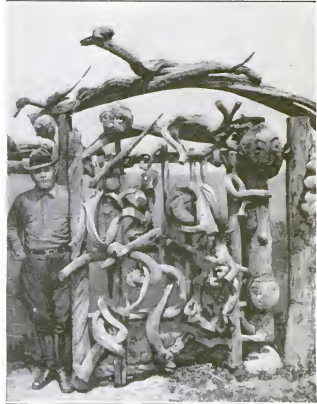
Using driftwood that had been washed up on the western shore of Flathead

WOOD IGNITED THROUGH SAND 530 BY TAR HEATER

Recent experiments by the Bureau of Standards have shown that a tar heater is likely to set fire to woodwork below unless insulated by at least 6 inches of sand. Tests were made with a sand cushion varying from 2½ to 6 inches, laid over double metal sheets on two thicknesses of 1¾-inch wood flooring, and in each instance the sand was covered with roofing slate ¾ to ½ inch thick. The burner was 2½ inches above the top of the slate. Fire was noticed in less than 5½ hours with the sand cushion 2½ inches thick, and with a 6-inch layer a temperature of 350 to 390° F. developed at the end of 10 to 12 hours.

CRANE ATTACHED TO TRACTOR GREAT AID TO FARMER

By attaching a crane to a small agricultural tractor, a Missouri farmer has created a combination that is a great aid around his place. The crane has a 10-foot arm, a lifting capacity of 1,000 pounds, can pick up a load 12 feet below level and elevate it to the same distance above ground, the entire mechanism being conveniently and easily controlled from the driver's seat.



The Queer Gate Pictured Above was Made by a Resident of Montana with Bits of Driftwood Washed Up on the Shores of a Lake near His Home

Lake, near Dayton, Mont., a resident there has constructed on the gate to his home a curious jumble of snarled wood, freak-shaped serpents, and hideous-looking heads, of varying sizes. The wood, which in some cases was slightly whittled, is mostly from the root branches of pines and aspen. To add to the grotesque effect, serpent "eyes" that flash in the sunlight, were made from old spectacle lenses or the heads of steel nails.



Crane Attachment for a Tractor, Shown Lifting a Heavy Reel of Wire: This Contrivance has Proved to Be a Great Help around the Owner's Farm, in Picking Up Barrels, Boxes, Crates, Sacks of Grain, and the Like, and Provides an Inexpensive Method for the Farmer to Lighten His Daily Tasks

clw Herbert Lessman
% Peggy Ore, 725 Oak Park Ave
also moines. Iowa

Mine Safety Appliance Co
Chamber of Commerce Bldg.
 922 **POPULAR MECHANICS**
Pittsburgh, Pa.
GAS MASK HOSE CONNECTED
TO A DISTANT BLOWER

303 Gas masks, for industrial use, are now being made with a hose connection to a



Left: Wearer of the Hose-Connected Gas Mask Climbing Out of a Chemical-Treating Tank after having Cleaned It. Right: Complete Apparatus Packed in Its Trunk, with the Rotary Blower in One Corner

blower, and without any chemical canister, such as was used in the gas masks during the late war. The face piece of the mask is similar to the improved army model that fits all faces equally well, and has much less dead-air space than any mask previously developed. Nose clips and mouth-pieces have also been eliminated, making the mask much more comfortable for the wearer. The hose that supplies fresh air from the blower to the mask is of the flexible-metal type, and is therefore noncrushable. The complete apparatus is packed in a trunk, with a rotary blower in one corner of it, and its crank handle outside, so that it can be operated by hand at any required distance from the wearer of the mask. It has proved to be a perfect protection against the most deadly and penetrating gases, such as carbon bisulphide, hydrocyanic acid, carbon monoxide or ammonia, and is equally effective against dust and smoke. Fifty feet of hose is supplied with the outfit, but if it is desirable, much greater lengths can be used.

8625
A THRILLING
BALLOON STUNT
BY EUROPEAN
DARE-DEVIL

It would almost seem that the possibilities of air stunts had been exhausted, but Harry Piel, European stunt maker, has come forward with a new one in which he rescues an unconscious person from the top of a tall chimney, using a balloon to travel in.

—USA
"STRANGE LIZARD"
STUDIED NEAR
A DEAD SEA

443 Searching the arid southwestern section of Santo Domingo in the vicinity of a dead sea, the bottom of which is 100 feet below sea level, an expedition from the New York Museum of



With the Gas Bag Swaying Overhead, This Stunt Maker Rescues an Unconscious Person from the Top of a Tall Chimney

Natural History hopes to secure pictures and data concerning the "rhinoceros lizard," the existence of which is said to be confined to that country. This lizard is of large size and its head features resemble those of a rhinoceros. The same expedition plans to journey through the mountains of the northeast to secure information regarding the life of the giant tree frog, also an exclusive inhabitant of this land. Little is known of this creature, although it is one of the largest and most interesting of the frog family. It is said to be 8 to 10 inches long. The material collected will be used for the construction of two habitat groups in the Hall of Reptiles.

Science 8/18/22
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Société Hydro. Electric. de Lyon. France
31, Rue Terriandière, Lyon, France
PICTURESQUE HYDROELECTRIC PLANT IN FRANCE

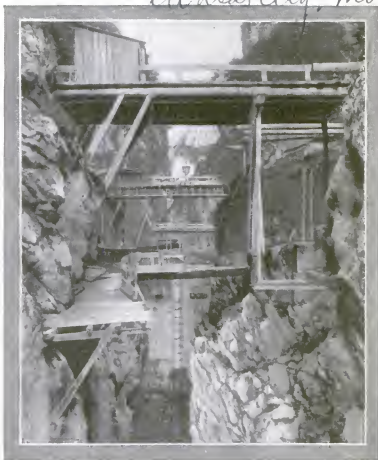
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BY ALLEN P. CHILD

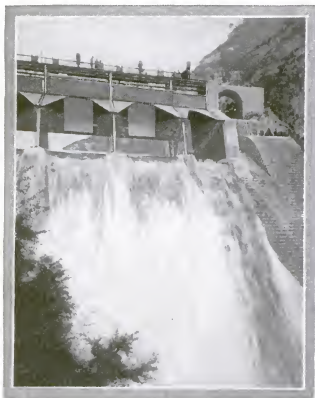
*Box 73, Station E
Kansas City, Mo.*

ON THE River Fier, near Seyssel in the department of Haute-Savoie, France, and not far from the confluence of that stream with the Rhône, operations were commenced, in 1913, for the building of a hydroelectric plant which is of unusual interest because of the scenic beauty of the surroundings and some of the construction problems involved. The work was suspended in 1914, and although it was resumed during the latter days of the war, the difficulties in obtaining materials delayed completion until a comparatively short time ago. On account of the scarcity and excessive cost of coal, the availability of this constant and cheap power is particularly welcome in France, where this development is of added importance in giving impetus to the utilization of other resources of a like nature, thereby bringing relief to many of the distressed industries of that country.

Advantage was taken of the difference in water level that existed as the Fier wound its rapid course through the gorges of

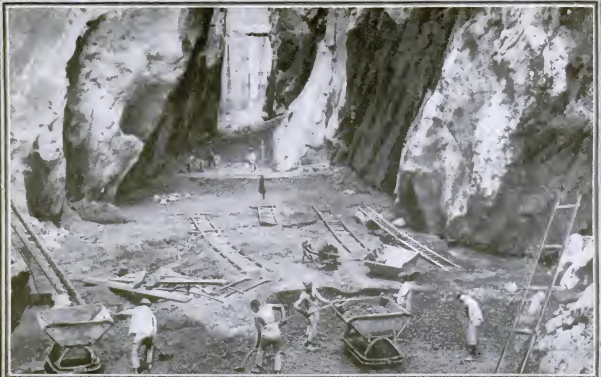


A View of the Gorge, Showing Temporary Bridges for Transporting Materials Used in the Construction of the Dam and Tunnels of a French Hydroelectric Development



Water Flowing through the Spillways of Completed Dam of Power Development on the River Fier, Haute-Savoie, France

that region, by building a dam between the precipitous sides of a deep-walled chasm, the preparation of whose rocky bed for the base of the dam was one of the most laborious undertakings. In lowering the caissons for the cofferdam work, it was necessary to inject cement into the gravel so that the work chamber could be deepened to bedrock below the river bottom and a firm footing provided for the foundation of the dam. The removal of the material from within the cofferdam was largely a matter of work by men with picks and shovels. To divert the flow of the river from the dam site during the construction period, a tunnel had to be cut through the solid rock on either bank. The water raised by the dam is carried 450 feet through a mountain, by a tunnel of 100 square feet area and connecting to a chamber above the power plant, the turbines of which are supplied by five penstocks, each about 380 feet long and $3\frac{1}{2}$ feet wide. The ultimate development of this power site contemplated a capacity of 27,000 horsepower to be delivered by five turbine units, of which only four, of 5,000 horsepower each, were to be in-



Clearing the Débris of Centuries from the Bed of the Fier River, So as to Provide a Firm Footing for the Dam at That Point: In Sinking the Caissons, Cement was Injected into the Gravel in Some Places



Hydroelectric Plant on the Fier River in France: On the Side of the Mountain can be Seen the Bulkheaded End of the Tunnel, and the Penstocks Which Conduct the Water to the Turbines in the Power House Below



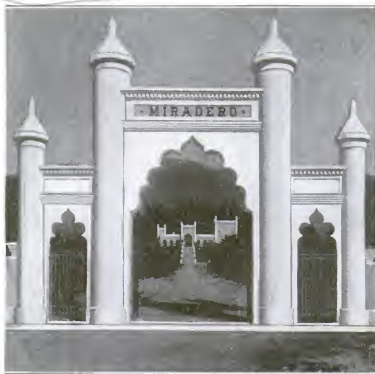
General View of Fier River Power Development during Construction at the Dam Site: Note, at Lower Edges of Picture, Outlets of Tunnels on Either Side of the River, Used to Divert the Flow during Construction

stalled at first: Three-phase current is generated at 10,000 volts and raised to 75,000 volts in the near-by transformer station, for distribution to the city of Lyon, some 50 miles distant, and to vari-

ous manufacturing plants in Savoy. It is stated that the fifth generating unit, intended to be capable of delivering 7,000 horsepower, would supply one-third the power used by the city of Lyon.

PROSAIC CONCRETE GIVES TOUCH OF FAIRYLAND

The remarkable effects that can be produced by the skillful use of concrete are strikingly shown at a country residence, near North Glendale, Calif. Here, across the mouth of a green cañon, stretches a solid wall whose gateways of dazzling brightness frame a fairy palace set at the foot of



the giant hills. Round about this stately dwelling stretch the orange groves. The white walls and slender towers stand out in sharp contrast to the dark green of the tropical foliage. From far down the valley can be seen this enchanted palace of Miradero, silhouetted in white against the green hills beyond.



Above: Entrance to a California Estate, Which is Made of Concrete and Ornamental Ironwork. The Large Pillars Are 26 Feet High and the Smaller Ones 16 Feet High. Below: The White Walls and Slender Turrets of This Castlelike Home are Built of Concrete

9617
Estate of L. C. Brand
North Glendale, Calif.

Encl. Israce Crly
106 North St
4745 W. Lafayette
and.

POPULAR

MECHANICS

STATE-OWNED FLOURMILL NEARING COMPLETION

Three years ago the North Dakota legislature provided for the establishment of a system of elevators, mills, factories, and warehouses, owned and controlled by the state, for the purpose of placing the agricultural products more directly in the hands of the consumer, and authorized the building of a large modern grain elevator and flourmill, in order to give the idea a "fair trial." There was not much progress for some time, owing to difficulties in financing and other delays, but this \$2,500,000 undertaking is now nearing completion and it is expected that it will be operating in a few months.

The plant, located at Grand Forks, will include an elevator for the storage of 1,500,000 bushels of wheat and a flourmill of 3,000-barrels-per-day capacity, consisting of two 1,000-barrel spring-wheat units, and one 1,000-barrel macaroni unit. The plans call for a main mill building 42 by 160 feet and eight stories high, with a basement wing 42 by 200 feet on either end. Reinforced-concrete type of construction, with brick-and-tile curtain walls and steel sash and doors, will make the structure fireproof. A feature of the design is the location of all cleaning machinery in the stories above the bin floor, and the location of the packers on the second floor.

Native bullock carts in Colombo, Ceylon, are being fitted with rubber tires to allow of easier movement and to check the damage done to road surfaces.

TANK EQUIPPED WITH RADIO LATEST WAR MACHINE

Tanks equipped with radio apparatus are the latest addition in warfare and are being extensively used at present in sham



"Baby" Tank Which is Equipped with a Complete Radio Outfit.
Having a Sending and Receiving Range of 25 Miles, Showing How the Perpendicular Antenna is Mounted

battles and army maneuvers, to determine their practicability. The machines are of the ordinary "baby" type, and although they carry no guns, are heavily armored with steel to protect the occupants. Two men constitute the crew of these battle scouts, one a radio operator and the other a driver. Their function is to be an intermediate in the relaying of messages between the advancing fighting tanks and the main receiving and transmitting station at headquarters. A mast to support the aerial is

raised on the tank, and the equipment has a sending and receiving range of 25 miles, which distance is thought to be sufficient to permit of efficient communication during any battle.

DRY BATTERIES NOW INCLOSED IN STEEL CASE

A leading manufacturer of dry-cell batteries is introducing a new battery that is put up in a steel case, which has a number of advantages over a fiber container. It is constructed to withstand the roughest service, the full life of the battery being assured by the steel case, which also protects against exposure to moisture and the elements. The materials used in lithographing the container serve as an electrical insulation for the outer surface.

National Carbon Co. Inc.
Thompson Ave. & Clayton St.
Long Island City 44

Dunes. Capt. Carl Knechler.
1026 Columbia Ave.

Engineering
News-Record
8/14/22
Supply
Harvey

928
 9909

POPULAR MECHANICS
HOMEMADE STERN-WHEELER
DRIVEN BY LEG POWER

BRITISH GUIANA WATERWORKS
OF UNUSUAL CHARACTER

Built to resemble a miniature steam-boat, with pilothouse, cabin, and stern paddle wheel, is a homemade man-pro-

The waterworks of Nabaclis, British Guiana, have some novel and interesting features. In an artesian well, 600 feet



Man-Propelled Homemade Stern-Wheeler for Use around Bathing Beaches during the Summer: The Driver Sits at the Stern of the Boat and Rotates the Paddle Wheel with His Feet

pelled craft used by its Cincinnati owner around the bathing beaches in summer. Seated at the stern, the driver rotates the wheel by pushing on the paddles with his feet; and the speed of the boat depends upon the dexterity with which this is done.

located at suitable points in the village. To avoid pitting of the iron pipes, the 6-inch mains are lined with bitumen.

ATTRACTIVE RADIATOR DEVICE
WARNS OF OVERHEATING

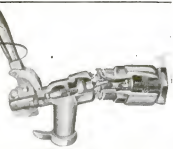
A new radiator device consists of an eagle, mounted on the radiator cover, with a bull's-eye in its breast which instantly colors red when the water in the radiator reaches 210° F. This effect is obtained by means of small disks in the radiator cap which expand and so raise a metal shaft. The shaft in turn pushes a hinged plate behind the bull's-eye up-

SAFETY VALVES FOR FAUCETS
OF GASOLINE-TANK TRUCKS

Now that the tank truck is the general mode of transporting gasoline, and other volatile fluids, it is of importance to have

safeguarding appliances in case of accident. One of such appliances is for preventing the discharge of the gasoline from a tank in case

of damage by collision, or otherwise, to its faucet. Besides the ordinary poppet valve in the faucet, there is an auxiliary safety valve which is operated normally by an extension of the plunger rod on which the faucet valve is mounted. Should the faucet be broken, this safety valve automatically closes.



Three Views of Indicator, Showing Appearance from Driver's Seat at Normal Temperature and When Overheating Threatens, and from the Front with Filler Cap Open

ward, so that its lower half, which is red, replaces the normally visible upper half, which is white and radium-treated.

The Synhameter Corp.
230 E. Ohio St., Chicago

Columbian Steel Tank Co.
Kansas City, Mo.

Illustrated MEDITERRANEAN GRAPES GROW IN NORTH CAROLINA

Mediterranean grapes, said to thrive nowhere else in the United States, are successfully grown on the mountainsides near Tryon, N. C. The reason for this phenomenon is a locally termed "thermal belt." This title is a misnomer, however, as the temperature differs little from that of the surrounding section, where fruit that grows readily in the belt would not survive the first frost. Frost and dew are never experienced here. Air currents are formed on the mountainsides when the cold atmosphere from the Asheville plateau, about 2,500 feet above sea level, rushes through the gap between the Tryon and Saluda ranges, to the lower and warmer country to the south. These air currents evaporate the moisture that would form frost or dew. Other semi-tropical fruits, which can be cultivated only in Florida and southern California,

produce profusely on these mountains, although they are covered with snow the greater part of each winter.



Map Showing Parts of North and South Carolina in Which is Located the "Thermal Belt," Where Mediterranean Grapes are Grown

296

INTERESTING CHINESE TOMB IN NEW ORLEANS

A tomb that is never used for burials in the usual sense of the word and which is fitted with a fireplace that is not used for heating purposes, is one of the interesting attractions for tourists in the picturesque Greenwood cemetery at New Orleans. It is the temporary resting place for the bodies of



The Entrance to a Chinese Tomb in the Greenwood Cemetery at New Orleans, Used as a Temporary Resting Place for Bodies Later Sent to China

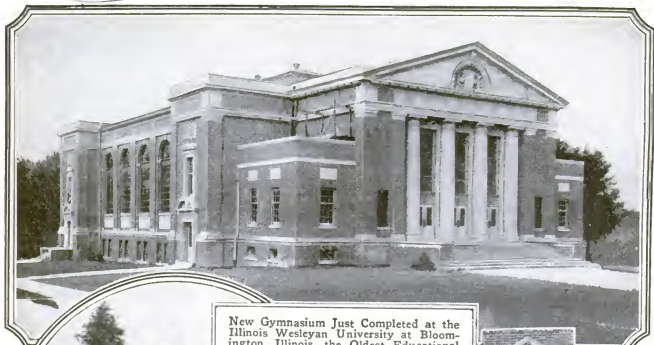


Interior of the Tomb: To the Left Is the Fireplace Which is Only Used for the Burning of Printed Prayers

dead Chinese, which are later sent back to China for interment in Buddhist burial places, and the fireplace is for the burning of printed prayers. The structure, large and plainly built, has individual vaults for the coffins.

Greenwood Cemetery, New Orleans, La.

CIVIC FEATURES THAT PROMOTE THE COMFORT



New Gymnasium Just Completed at the Illinois Wesleyan University at Bloomington, Illinois, the Oldest Educational Institution of the Methodist Episcopal Church in the Mississippi Valley



Exact Replica of the Cottage in Ayrshire, Scotland, in Which Robert Burns was Born, Erected at Atlanta, Georgia, as a Memorial to the Poet, by the Burns Club of That City



One of Two Boundary Marks at Salem, Massachusetts: The Sign Is of Wood, 15 Feet High, Painted to Represent a Symbolical Colonial Doorway with a Salem Witch on Its Steps



One of the Several Auto Buses That are to be Placed in Service by the Chicago Elevated Railway Company for the Purpose of Carrying Residents of Outlying Districts to the Nearest Elevated Station

AND ENJOYMENT OF VISITORS AND RESIDENTS



COPYRIGHT, BETHE BROS.
Head of a Parade of 200 Automobiles Entering Green Bay, Wisconsin, at the Formal Opening of Highway 15, Which Is the Last Link in the Concrete Road That Connects It with St. Louis, Missouri



Motorcycle Sidecar Used by New Orleans Public Service Company for Transporting Welding Outfits



ABC, as a Traffic Sign at All Dangerous Crossings and Corners in Detroit, Stands for "Always Be Careful"



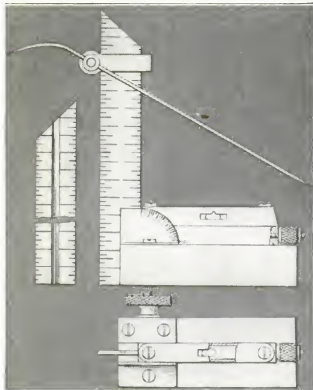
Public Radio-Receiving Station at Greenfield, Indiana, Installed on a Signboard on the Principal Street of the Town: Just below the Horn Is a Bulletin Board Giving Schedules of Programs

Edw. Frederick Stanton
1321 Park Blvd.

9826 ⁹³²Camden, N.J. POPULAR MECHANICS

IMPROVED GEOMETRIC DEVICE
IS A HANDY TOOL

Mechanics and others having to lay out and measure work, will be interested in a combination geometric instrument. A



This Handy Shop Tool Combines the Essentials of a Number of Measuring Instruments Used in Laying Out Work

self-contained unit has been devised that includes all the essentials of a rule, scriber, level, plumb, square, inclinometer, surface and depth gauge, bevel, and protractor. The convenience of such a tool lies in the facility with which it can be assembled and operated.

863 LADDER FOOT THAT CANNOT
—SLIP OR INJURE FLOOR

Feet for the bottom of a ladder have been devised to prevent it from slipping



Ladder Feet That Prevent Slippage, in Use at Left, and Enlarged Below

or marring the surface of the ground outside, or the floor inside, a building. At the bottom of each leg of the ladder is a bent-plate attachment that has on its outer center a socket that fits over a partly spherical projection from the top of a cast-iron circular support. The bottom of this support is covered with rubber which prevents slippage, and it can be used safely with a board under it to prevent damage to the ground or floor from pressure.

447

FREE MEDICAL ADVICE SENT
TO SHIPS BY RADIO

Free medical service by radio for ships at sea has recently been established by the United Fruit Company to assist vessels that do not carry surgeons. The service is also at the disposal of ships carrying medical officers, who may, in the case of an obscure malady or in other emergencies, desire the benefit of consultation with other physicians.

nautilus 8/19/22 Used for
SMALL TRACTOR CONVERTED
222 INTO A ROAD ROLLER

That a small gas tractor can be readily changed into an efficient light roller for road work was demonstrated recently in

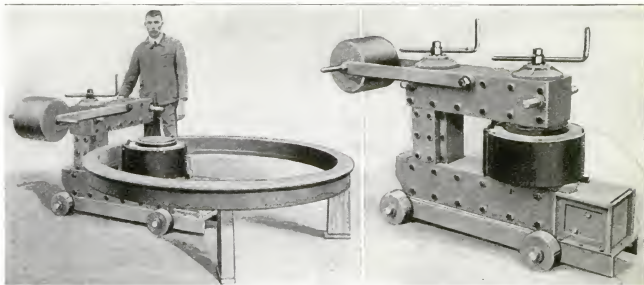


Small Gas Tractor That was Converted into a Road Roller by Substituting for Its Ordinary Traction Wheels Golf-Course Wheels Filled with Cement

a very simple manner. Each of the traction wheels was replaced by a golf-course wheel with extension rims that had been filled with cement inside the rim, so as to make its outer face smooth, and like a stone roller with a tread of 20 inches. The cement brought the weight of the tractor up to 5,000 pounds, and this proved to be quite suitable for doing the road-rolling work required.

demonstrated by
nautilus & crew, J
Wm. Effingham, d.l.

Edw. Frederick Stanton
San Diego, Cal.



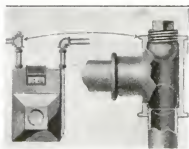
Left: Electrical Transformer Shown with Its Upper Arm Swung Around, Permitting the Introduction of the Railroad-Car Wheel Tire for Heating, and Subsequently Mounting It by Shrinkage. Right: The Arm is Shown Swung Back, Putting the Transformer into Operative Position

TIRES ELECTRICALLY HEATED AND FITTED BY SHRINKAGE

For heating railroad-car wheel tires before mounting them by the shrinkage process, an electrical method is in use in France in which the tire forms the secondary of a transformer, being heated by the induced current. The transformer has two laminated horizontal arms, one above the other, connected by a pair of vertical cores. The upper arm is pivoted and counterbalanced so that it can be swung around to permit the introduction of the tire. It is then swung back, putting the transformer into operative position. The heating is quite uniform, and can be readily controlled.

AUTOMATIC GAS-METER VALVE REDUCES DAMAGE BY FIRE

To obviate the danger, during a fire, of the gas meter or its lead connections melting,



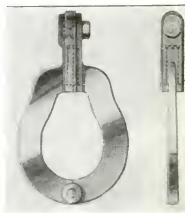
ing, and allowing the gas to flow freely into the burning building, a valve has been devised that closes the inlet pipe automatically under a temperature of 130° F. The valve takes the place of the ordinary pipe elbow on the inlet side of the meter. Screwed into the top of the new elbow is a plug that has soldered onto the bottom of it a copper-plated steel ball. Directly below the ball

is the open end of the nipple that connects the inlet pipe with the meter. The heat of a fire fuses the solder, causing the ball to drop onto the nipple, shutting off the gas, and being held there securely by its pressure.

NEW AUTOMOBILE-WHEEL LOCK SAFEGUARDS TIRE VALVE

For safeguarding automobiles and spare tires, a new wheel lock has been devised that, besides embracing the

wheel rim and tire so as to prevent the wheel from rolling on the ground, also makes the tire valve inaccessible. The lock consists of two steel arms, which are pivotally connected outside the tread of the tire. When closed together, they embrace the tire and, with a projection inside the rim, completely inclose the dust cap on the valve tube. In this position the device is locked with a key, and it is then impossible to turn or move it, and equally impossible to get at the valve so as to deflate the tire, and thus make the device movable.



Whenever you find that you wish to know more about any article in the magazine, write our Bureau of Information.

Arthur M. Cummings, Aberdeen, Md.

Chas. W. Inge.

Automatic Gas Valve Co.
137 Pearl St. Boston, Mass.

SOME NOVEL AND LITTLE-KNOWN ACCESSORIES



Cast-Aluminum Teakettle Which may be Filled under Any Faucet without Burning the Hand with Steam



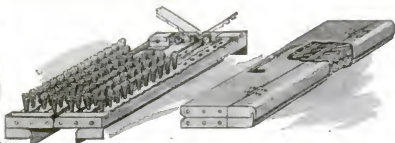
Sweet-Corn Slicer That Quickly Cuts the Corn from the Cob: It Has an Adjustable Blade, Guarded to Prevent Accidents



Three Views of the Collapsible Baby Carriage, Showing the Many Convenient Ways of Using It: The Entire Outfit Folds into a Space No Larger than a Suitcase, and Weighs Only 23 Pounds. In Winter, Steel Runners may be Attached to the Frame

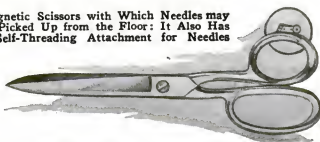


All-Metal Dressing Table, One of a Series of Home Furnishings That are being Introduced in the Interest of Sanitation



Hairbrush, with Renewable Bristles, That Opens and Closes Like a Book: When Closed, It Takes Up Less Space than the Ordinary Spectacle Case and may be Carried in the Vest Pocket

Magnetic Scissors with Which Needles may be Picked Up from the Floor: It Also Has a Self-Threading Attachment for Needles



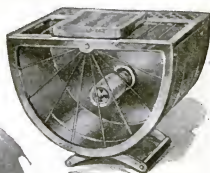
Anyone wishing further information on devices described in the editorial pages can

INTENDED FOR THE HOME AND ITS MEMBERS

Ci



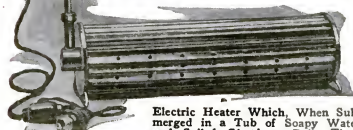
Vegetable and Fruit Slicer with Adjustable Guard That may be Set So as to Cut to Any Desired Thickness



Two Views of Electric Appliance, Showing How It may be Used Either as a Heater or a Toaster



Heat-Retaining Dish in Which the Housewife may Prepare Food before Mealtime and, Due to the Vacuum Insulation of the Dish, Keep the Edibles Steaming-Hot until the Proper Serving Time



Electric Heater Which, When Submerged in a Tub of Soapy Water and Soiled Clothes, Boils Them

Leather Saddle Strap That Fits Neatly over Any Oxford, Thus Giving It the Appearance of a Sport Shoe



Machine That Washes, Sterilizes, and Bleaches the Clothes in One Operation, and Is Noiseless



Fresh-Air Bed, for Adults, with Removable Screens, Which Makes an Inexpensive Sleeping Porch

221

Emf. R. Franklin Munday.
110 8 Arden Ave.

936

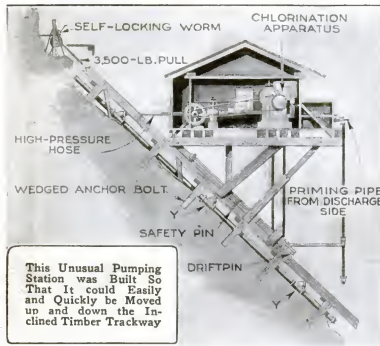
POPULAR MECHANICS

Kansas City, Mo.

PUMP STATION ON INCLINE FOLLOWS WATER LEVEL

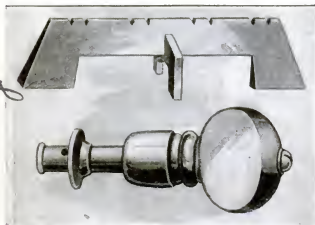
In providing water supply for a construction camp at a dam on the Tuolumne River in California, the records showed

that the water level in the stream varied as much as 52 feet at this point. As the water supply was to be in use for more than one season, it was decided to put the pumping plant on a platform that could be moved up or down an incline when the water level changed. Timber rails, bolted to sills anchored to the bank, formed guides to which were fastened, with safety driftpins, the skids that carried the platform and pump house. A hand-operated winch with a self-locking worm served to raise or lower the plant. A flexible high-pressure hose was arranged to connect the pump discharge to "Y's" at 10-foot intervals on the 4-inch delivery pipe laid between the rails. The suction was provided with a foot valve and strainer and also with a priming pipe from the pump discharge. The centrifugal pump was belt-driven from an electric motor.



282 NONSLIPPING TUNING PEG AND BRIDGE FOR BANJOS

Tuning pegs for banjos, violins, and similar stringed instruments, are now being made so that they will never slip.



Below: Tuning Peg for Stringed Instruments. It cannot Slip, and Maintains Perfect Tuning.
Above: Nontipping Banjo Bridge

In connection with the peg is a strong spring that exerts a constant gripping pressure on the peg head. On the stem of the peg is a washer that centers it. Nontipping bridges are also being made that keep the banjo strings tight, and that cannot get out of position while the instrument is being played.

338 COMBINED HAND AND BENCH VISE FOR SMALL WORK

A combined hand and bench vise for use in machine or woodworking shops, and consisting of two main parts, is now on the market. One part, with an anvil attachment, is clamped to the workbench, and contains a tapered dovetail slot, into which fit corresponding shoulders on the vise proper. No setscrews are needed, and the vise can be slipped into this slot and held there securely when used as a bench vise, or be lifted out to be used as a hand vise. The jaws of the vise, open or closed, are held parallel by pivoted diagonals.



From Left to Right: The Anvil Attachment for Clamping to the Workbench; the Vise Separated from This Attachment; the Two Parts Fitted Together

Malleable Iron Fittings
Co., Bradford, Conn.

Ans. Lerner. Eng Island, Ct.,
nig

LIGHT PORTABLE SCAFFOLD IS EASILY MOVED

A number of uses suggest themselves for a portable one-man scaffold that has lately been designed and is now being manufactured. Two upright extension ladders are supported at the ends of a light steel frame and suitable braces are provided to hold them rigidly when extended. The frame is supported on three



Above: Portable Scaffold Collapsed, Showing Steering Handle and Wheel. Right: Scaffold Shown Solidly Erected, Ready for Use



small wheels when being moved, but is so arranged that it rests solidly on two wheels and two legs when erected. When the scaffold is to be moved some distance, it can be collapsed, and a steering handle is provided for pulling it about.

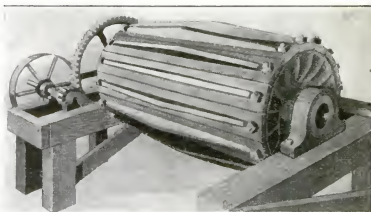
TRAINING CAMP ESTABLISHED FOR ARMY BALLOON PILOTS

The U. S. Army is concentrating its efforts in lighter-than-air craft flight by establishing, at Scott Field, near Belleville, Ill., the only training school for that branch of the service. The camp will be known as the Air Service Balloon and Airship School, and already large detachments of officers and men have arrived there from Ross Field, Calif., and Langley Field, W. Va., everything being complete except the huge hangar that is being erected to house the balloons. The student course covers a period of not less than two weeks.

A former English war pilot is the leader of a movement to finance a north-polar expedition. He estimates that a dirigible airship, making 50 miles per hour and carrying a crew of 10 and supplies, could make the final 700-mile dash.

QUARTZ MILL FOR PROSPECTORS CARRIED BY BURROS

Gold prospectors may now transport their own quartz mill by way of the common "burro-back" route, a portable and inexpensive outfit having been made for the purpose. The total weight of the assembled mill is only 1,800 pounds, the heaviest piece weighing but 185 pounds, which can easily be carried on any moun-



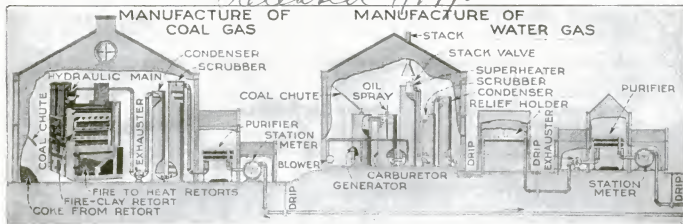
Barrellike Quartz Mill Which Has a Capacity Equal to the Usual Three-Stamp Mill, and Which was Designed as an Inexpensive Outfit for the Use of Prospectors

tain trail that a burro can scale. A gasoline engine of 1½ horsepower, for operating the mill, is included in the outfit, which thus enables the miner to grind his quartz "prospects" himself.

*Chas. E. C. Brownbridge
Madison, Oregon*

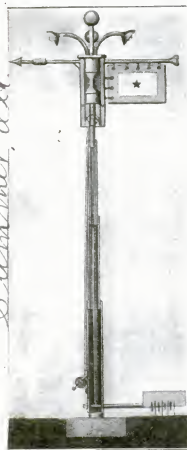
Madison Oregon works

Released 9/17/22



18 5 FLAGPOLE IS ILLUMINATED AND FORMS WIND VANE

An improved flagpole, especially adapted for supporting service flags, is so constructed that the flag can be easily raised or lowered.



The pole consists of a series of tubular sections with threaded joints. At the upper end of the pole is a sleeve that can be raised or lowered by means of small pulleys and a cable. This sleeve is in two parts, the upper one supporting two outwardly extending rods, one of which holds the flag and the other a pointer. It is free to rotate and thus to act as a wind vane. On top of the sleeve are brackets that support electric lamps which are connected to wires extending through the hollow pole from any source of electricity.

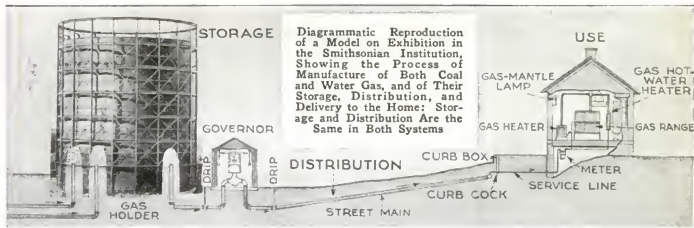
■ A motion-picture organization, which is stated to have ample financial backing, has been formed whose aim is "to provide clean pictures for clean people." The pictures will be distributed among church congregations, schools, and colleges.

36 7 MANUFACTURED GAS: HOW IT IS MADE AND DELIVERED

On account of the rapid exhaustion of natural gas, the time is not far distant when many towns now using it will have to depend entirely upon the manufactured product. With the object of instructing the layman in the salient features of the manufacture of gas, and its use in the home, the Smithsonian Institution has placed on exhibition a model that shows the whole process from the retort in the gas house to the lamps and stoves in the dwelling house. First is shown an air-tight fire-clay retort charged with bituminous coal, the gas, after four hours' heating, passing into the hydraulic main, from which it is withdrawn by the exhaustor and pushed on to the condenser. Here it is cooled, and the tar is extracted from it before going through the purifier, where the sulphur is removed, and then on through the station meter, which measures the volume, into the large storage gas holder.

In some plants coal gas only is manufactured, in others water gas only, and in many both are made and mixed. The basic feature of the water-gas process is the bringing of steam into contact with red-hot coke or coal, and thus making an inflammable gas. This is done in the generator, from which the gas produced passes to the carburetor where it is enriched by a fixed gas made by spraying oil under pressure over hot brickwork. Thence the gas passes successively to the scrubber and the condenser, where it is treated in much the same way as in the case of the coal gas. From the condenser the gas goes into the relief holder, where pressure on the gas is produced and its delivery to the purifier beyond is made uniform. The process is then complete, and the gas goes through the station meter to the large storage holder.

Inv. Invt. H. Rague,
Des. Invt. H. Rague,



From the storage holder the gas passes to the governor, where the pressure is regulated and kept uniform. From the governor it goes into the street mains, through the curb cock, service line, house meter, and to the consumer's appliances.

DIRECT WIRELESS SERVICE TO AUSTRALIA

Direct commercial wireless service to Australia from North America and England, with feeder stations in many of the large intermediate cities, are the essentials of a development contemplated by an English concern. This company has agreed to carry all messages between England and Australia at 33 1/3 per cent less than existing charges, with a corresponding reduction on press and government exchanges. It is also its announced intention to introduce wireless telephony throughout the southern continent for public and private convenience.

AUTOMOBILE TIRES HAVING FIXED BLOW-OUT POINTS

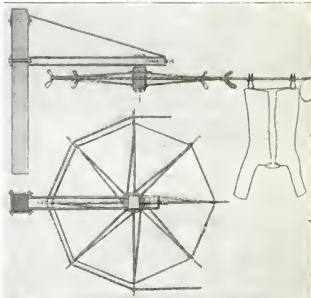
An inventor's idea of minimizing injuries to tires is to provide certain places on the sides of the shoe where the wall is weakened. A blow-out, due to any cause except direct puncture, is thus confined to one of these spots. Special arrangements are made to repair the rupture, easily and effectively, with suit-



able plugs and patches, which may be applied either from the outside or inside of the tire.

PULLEY-CLOTHESLINE OUTFIT 9807 HAS MANY MERITS

Many merits are incorporated in a pulley-clothesline outfit invented by a Utah man, which may be so arranged as to be driven by a motor. Both sides of the line can be used with the new device, and any piece of the wash may be



Pulley-Clothesline Outfit, Showing How the Garments may be Hung below the Line and Thus Not Come in Contact with It

removed without disturbing the remainder. The clothespins provided with the outfit, are made of a special nonrusting spring-wire material, so adjusted that they suspend the clothes below the line. This eliminates the necessity of cleaning the line every time the clothes are hung out to dry, as the washing does not come in contact with it. In addition to the foregoing, the clothes may be attached to the pins while yet within the house, this fact being an obvious improvement, which will be welcomed in inclement weather, as wet hands need not be exposed to the frosty air.

Dr. G. F. Johnson.
188 S. Dickles Ave.
New Rochelle, N.Y.

London Times Eng. & up
8/12/22

M. Kilgore, Mont. Utah

Nov 7 red

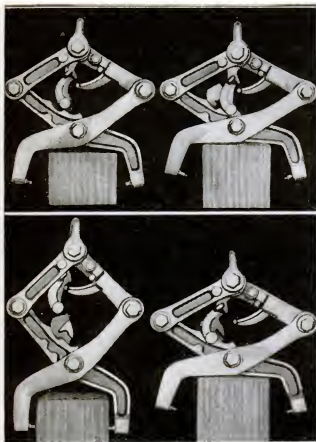
*Blaw, Knox Co.,
Pittsburgh, Pa.*
POPULAR

*Portland Cement,
Green, 111 W. Washington
St., Chicago Series m. 11.*
MECHANICS No 2, Aug. 28, 1922

940
9849

GRAB TONGS OF NEW DESIGN WORK AUTOMATICALLY

A recent development in material-handling devices is being marketed in the form of grapple tongs that operate auto-



Above: Grab Tongs being Lowered Preparatory to Picking Up Work. Below: Tongs Holding Work and Just After It has been Released

matically, dispensing with the services of one man. The action is controlled by a link and pin, which disengage from a cam as the tongs are lowered against the work, when the tongs are free to grip it. In setting down the work, the tongs are again lowered against it, and the pin, guided by another link, locks with the cam.

BRITTLINESS OF TINFOIL TRACED TO ALUMINUM

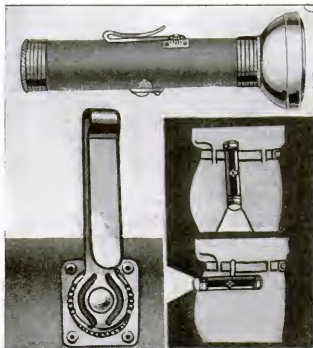
Brittleness in tinfoil a few days old, which, when freshly rolled, was soft and pliable, led to interesting investigations and developed the fact that it was due to the presence of a trace of aluminum in the tin. The conclusion was that electrolytic action between the tin and the aluminum converted the aluminum into aluminum oxide which caused a splitting action, commencing at the surface and gradually working toward the center.

LARGE QUANTITIES OF CLOTH USED FOR CEMENT SACKS

The cotton cloth used in the manufacture of bags for the cement trade, last year, would make a strip 30 inches wide and 17,000 miles long, or one that would reach two-thirds around the earth at the equator. In order to maintain the necessary stock of 200,000,000 sacks, the cement industry yearly orders approximately 30,000,000 new sacks. This is equivalent to 30,000 bales, or 15,000,000 pounds of cotton, which would keep busy 1,600 looms weaving it into cloth every day for an entire year.

SWIVEL CLIP NOW AVAILABLE FOR POCKET FLASHLIGHT

Holding a flashlight in any desired position without the aid of the hands, is possible with the use of a swivel clip which has been designed so that it can be hooked to the belt, pocket, or sleeve of a person's clothing. The person carrying the flashlight thus has both hands free to



Top: Swivel Clip Attached to a Pocket Flashlight. Bottom: Close-Up of the Clip, and Different Methods of Fastening It to a Belt

do necessary tasks in places where there is no illumination.

Popular Mechanics Magazine does not publish the name of maker or seller of any device described in its pages, but this information is kept on file and will be furnished free by addressing our Bureau of Information.

The Engineer
9/18/22

Chesnee Cotton Mill
" " , Spartanburg Co.
S.C.

The Robert Wrench Co.
71 Murray St.
New York City 941

POPULAR MECHANICS

VACUUM CLEANERS USED ON COTTON LOOMS

392

What is presumed to be the first cotton mill in the world to have its machinery and floors cleaned daily with vacuum cleaners is at Chesnee, in Spartanburg County, South Carolina. The mill uses 440 looms and 20,000 spindles, all of which are cleaned regularly. There are 130 hose connections through which the dust, ravelings, grime, and lint are carried into a large waste room. A one-horsepower fan furnishes the suction. It is estimated that the new system operates at a cost of about 70 cents per spindle per year.

265

GOLF-BALL SCALE GIVES WEIGHT AND SIZE

Determining whether a golf ball is of the proper weight and size to comply with the specifications of the United States Golfing Association, is possible with the use of a specially designed scale. With this instrument, tournament officials can rapidly examine all balls entered in any event, to ascertain whether they exceed the specified weight limit of 1.62 ounces, or fall below the permissible minimum of 1.62 inches in diameter. This method also eliminates all doubts for sporting-goods dealers.



441

RADIOACTIVE MINERALS FOUND IN ITALY

A bill recently presented to the Italian government, has for its object the utilization of deposits of minerals having radioactive properties, that are known to exist in some sections of the country. The most important of these seems to be that of a mineral called "autunite," found in a cave in the province of Cuneo, and which, Mme. Curie says, has radioactive properties superior to the minerals of America and Portugal and inferior only to those of Bohemia.

London Series Trade
+ Eng. Supplement
11/12/22

SELF-ADJUSTING WRENCH GRIPS AT ANY ANGLE

8771

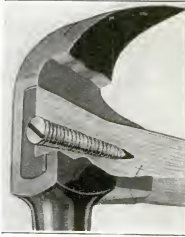
Of the many various modifications of pipe and nut wrenches that are constantly being placed on the market, one that is novel, and certainly entirely self-adjusting, consists of a straight handlebar with a jaw hinged to it by means of two links, each pivoted in nearly parallel position at one end on the handle, and at the other on the jaw. These links are connected by a coiled spring, the purpose of which is principally to make it possible to fit the jaw of the wrench onto a pipe or nut with the use of only one hand.



TOOL HANDLES RETIGHTENED WITHOUT CHANGING WEDGE

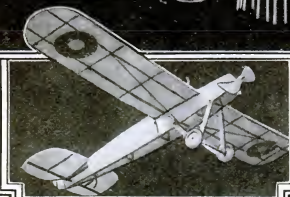
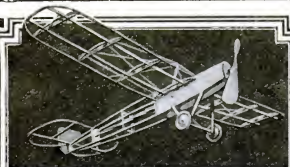
A wedge that will retighten the handle of a hammer, or similar tool, as often as

may be required, without the necessity of replacing it with larger wedges as the wood of the handle shrinks, has recently been patented. The wedge is in the form of a conical headless screw, slotted for the accommodation of a screwdriver. A hole is drilled in the handle to fit this screw, but somewhat deeper than its length, so that the screw can be driven farther into the head at any time to compensate for shrinkage. If the screw becomes loose, it is readily retightened.



Rayette & Blum, Inc.
Buckner & James, Phila.

CHILDREN'S PICTURE-STORY DEPARTMENT



Toy Airplane, with a Wing Spread of $3\frac{1}{2}$ Feet, Shown Assembled in the Bottom View: Center View Shows Its Parts, and Upper View Shows the Plane Complete without Its Covering



Occupying, When Not Out Riding, the Best Room in the Home of a Resident of Portland, Oregon, This Gander, Fondly Called "Bobbie" by His Owner, Has a Particular Liking for Auto Riding. He Keeps His Balance on the Hood When the Auto is Traveling Rapidly



At the Recent National Conference of Boy-Scout Executives in Blue Ridge, North Carolina, Daniel Carter Beard was Presented by James E. West, Representing All the Other Executives, with a Solid-Gold Eagle Badge

6 PAGES

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9th Ave., Miami, Fla.
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OF MODERN ACTIVITIES AND INTERESTS

Toy

Ad.

Side



Luxurious New Monkey House, with a Hospital Annex, at the Zoo in Cincinnati, Ohio: It Is More Like a Hotel than a Cage, being Equipped with Electric Lights, Baths, and Other Conveniences. In Other Ways, Also, the Monkeys are Treated Like Human Beings



Stilts with Adjustable Footrests, So That Any Boy Using Them can Put Them at Any Height He Likes from the Ground, and Even can Have Them at Different Heights, Like the Boy in the Picture



Some Pussy Cat! With Luminous Eyes, Both of Which can Roll, and Either One of Which can Wink: In the Dark They Are Very Startling. Pussy Is Black in Color, with Back and Tail Raised



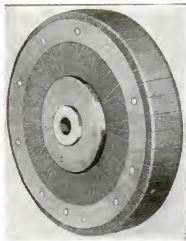
Something New, and Decidedly Convenient, in the Way of a Sidecar: It was Built in England, and the Youngster in the Car is being Transported by His Elder Brother, in the Saddle, along Fleet Street in London's Famous Newspaper District. The Youngster has Stopped Driving to Allow This Photo to be Taken

Metzger Register Co.
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Chas. B. McCarty
410 Franklin St.
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"END-GRAIN" WOODEN WHEELS FOR FACTORY TRUCKS

Noiselessness, durability, and absence of any factor that might have a tendency



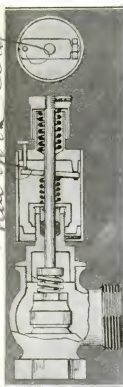
to wear out floors, are merits claimed for a new wooden wheel manufactured expressly for factory trucks. The wheel, which has also been used successfully as a motor pulley, is so designed that the wearing surface is diagonal with the grain, hence the term "end-grain."

RADIATOR VALVE CONTROLLED BY A TOUCH OF THE FOOT

The adjustment of a new radiator valve is done with a touch of the foot instead of by turning the customary handwheel.

The valve is normally held closed by a coiled spring housed at the top of its spindle. Sliding over this housing is a cap which is screwed onto the top of the spindle, and when pressed down by the foot, compresses the spring and closes the valve. The valve is held closed by the action of a small steel bar, through a hole in the center of which the spindle slides. This bar is hinged at one end in such a manner that a coiled spring below it forces it up and out of the horizontal, so that the sharp corners of the hole grip the spindle

and prevent it from being raised by the spring at the top. When in this position, this spring may be caused to open the valve by a little pressure on a button which forces the bar into a horizontal position, allowing the valve spindle to



slide freely. A third spring at the bottom of the spindle takes care of any tendency to move upward before the spindle is gripped by the horizontal bar.

SIMPLE DEVICE FOR WASHING JEWELRY AND WATCHES



A young jeweler has invented a simple device to assist in the rapid and effective cleaning of small pieces of jewelry and parts of watches. It consists of a tube, closed at the upper end by a removable cap, in which a plunger can be moved up and down by means of a rod passing through an opening in the cap. The parts to be washed are placed in the lower removable end of the cylinder, which is fitted with fine wire mesh on the sides and end. When placed in a cleaning solution, movement of the plunger produces a washing action on the parts to be cleaned. It is believed that it fills a long-felt need.

SWIMMING DEVICE FITS OVER BODY LIKE SUSPENDERS

Fitted over the shoulders like a pair of suspenders, a new lightweight swimming device seems to have combined practicality with a goodly measure of comfort.

Four tubes, two in front and two in back, are inflated by the wearer while on the body, through two valves attached to the front tubes. The lightness and shape of the device permit easy movement of the body both in and out of water. It was also designed for emergency use on vessels.



Shos E. Wilson Co.
701 N. Dearborn
Chicago

Chas. B. McCarty
454 N. Dearborn
Chicago



Homemade Stern-Wheeler for Construction Work

By GEORGE F. PAUL

A CONTRACTOR, working on the new bridge over the Missouri River at Yankton, S. D., solved the problem of conveying men and materials out to the piers in midstream in an ingenious way.

A flat-bottomed boat, 30 ft. long, of 5-ft. beam, was bought at a cost of \$30. The engine of a light automobile was removed, overhauled, and placed on sills, or chocks, bolted to the bottom of the boat, and the "rear end" of the car, without the

auto, with the exception, of course, of the brake. The engine served excellently for the short trips back and forth from the piers, although it showed a tendency to overheat. This could easily be cured, however, by fitting any one of the types of circulating pumps made for this engine, and the boat would thus be adapted for much longer trips.

The gasoline tank was fastened firmly to a wooden frame, beside the flywheel,



A Homemade Paddle Boat, Fitted with an Engine Taken from a Popular Car, Transports Men and Materials to the Piers of a New Bridge over the Missouri River. The Stern Wheel is Made by Bolting Boards to a Pair of Old Cultivator Wheels

wheels, connected to it again. A paddle wheel, made by bolting boards to a pair of old cultivator wheels, was mounted on a shaft and set in bearings, fastened to brackets projecting from the stern of the boat. Sprocket wheels were attached to the rear-axle shaft in place of the auto wheels, and drive chains run from these over two large sprockets keyed to the paddle-wheel shaft. A splashier was built over the paddle wheel, as shown, and the chains were run through guides bolted to the splashier, and through slots in the splashier itself. Two rudders, operated by one tiller, were fitted ahead of the paddle wheel. The transmission, driveshaft, and rear axle all functioned exactly as in the

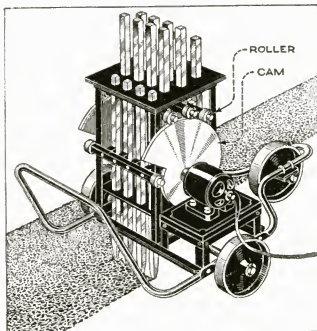
at about the same height as in the car, so as to retain the gravity feed.

The operator sits in about the same position as he would in the car, with his feet on the pedals, but with one hand on the tiller, and has the engine under complete control at all times.

In order to make the operation a little more convenient, the original steering column and wheel might be retained and the rudders controlled through wires, attached to the drag link, and run around small pulleys. This would enable the steersman to control the engine through the regular spark and throttle-control rods, which, for short trips, would be of advantage.

Roughening Smooth Concrete Surface

A large manufacturing concern found it necessary to replace a layer of several inches of asphalt on its receiving plat-



Smooth Concrete Surfaces can be Roughened by This Machine, Which is Operated by One Man, and Virtually Does the Work of Thirty-Two

form with reinforced concrete, because the asphalt hampered trucking operations. Upon removing the asphalt, the constructing engineer found a perfectly smooth base. It was not advisable to lay the new floor upon this, as the two would not bond perfectly, and therefore several men were employed to roughen the surface. This was a slow process, however, and, as time was an important factor in the case, the engineer designed the machine shown in the illustration, that was operated by one man and virtually accomplished the work of thirty-two. The machine was built, in a few days, from materials found around the plant.

Sixteen crowbars, vertically arranged in sets of four, are fitted into square openings cut in the top and bottom plates of the machine, and are fastened at the center to square crossbars that carry a roller at each end. These rollers run on the surfaces of the two cams shown, which are carried on a shaft running between the sets of crowbars, and are driven at a suitable speed by a 1-hp. electric motor. As the cams revolve, they lift and drop the crowbars automatically. The bars are sharpened at their lower ends, and, as the machine is pushed over the concrete surface, they chip it deeply enough to make a good bond with the new surface layer.—R. V. Hurr, Chicago, Ill.

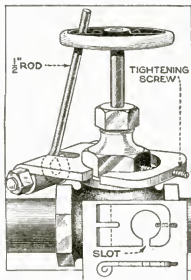
Novel Method of Painting Walls

An attractive finish for smooth, painted walls makes use of an undercoat that is lighter or darker than the top or finish coat, the latter being mottled so that the contrasting bottom coat shows through. At first glance this would seem to be a rather difficult effect to obtain, but it is really quite simple. The first coat of paint is applied and allowed to dry hard, and then the second coat is put on. The mottling is done while the second coat is still quite wet. A piece of fairly stiff wrapping paper is crumpled up thoroughly and rolled into a ball that can be easily held in the hand, or a ball of waste may be used. The ball is pressed firmly against the wet paint for a second and taken away. If the paper is crumpled up into a loose ball, the flat surfaces of the paper will come in contact with the wet paint, which will adhere to it and be removed, showing the contrasting undercoat, at those places. The same piece of paper or waste can be used until too much paint has been absorbed, when another should be used. The "texture" of the mottling can be varied by rolling the wad of paper tightly or loosely. The method works best with oil paints applied to a smooth surface, and a few trials will enable anyone to produce very pleasing effects with but little trouble.

Locking Steam Valves

Main steam or gas valves should always be securely locked in the closed position before men are permitted to work on any part of the line. It is not sufficient to hang a warning sign from the valve wheel, as this may be accidentally removed, and the valve afterward opened, with possibly serious results.

A simple lock, which will fit several sizes of valves, is shown in the drawing. It consists of a flat-iron strap, with a hole near one end large enough to fit over the bonnet nut of the largest valve

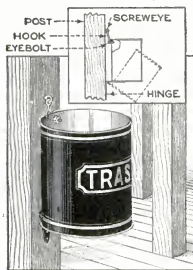


it is designed to protect. A hole for a tightening screw is drilled and tapped at this end, and a slot cut on the side to allow the device to be slipped past the stem of the valve. The opposite end is heated and bent over the stem of a bolt, as indicated, and a slot cut in it. A length of rod has an eye formed on one end to fit the bolt, after which the lock is assembled, and the nut on the bolt tightened.

To lock a valve, the rod is pushed between the spokes of the wheel, the slot in the strap is slipped over the stem, the strap placed on the valve bonnet, and the screw tightened on one of the bonnet-nut flats. This should force the rod against a spoke and keep the valve closed; if not, the device should be moved around the bonnet until the desired result is obtained. With this lock in place, the valve cannot be opened accidentally.

An Easily Dumped Trash Can

The method of handling waste cans shown in the drawing has several advantages, the principal of which are that the receptacles are always in the same place, and are very easy to empty. The cans are hinged at the bottom to a post or wall, and held vertically by a hook and eye at the top.



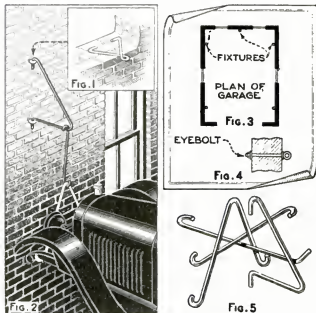
They are placed high enough above the floor to permit the contents to be dumped into a box or barrow.

Wall Fixtures in Garage Substituted for Hoists

When building a brick garage, the owner had a number of heavy bent steel rods imbedded in the walls, as shown in Fig. 1. The purpose of these was not evident until the garage was completed, when the owner fitted to them forged steel hooks, made as in Fig. 5, and thereby formed removable supports that were used in place of hoists or jacks.

Other bent steel rods were made to be hooked under the car frame or body,

after it had been elevated by means of a jack. In this way the body could be left suspended, as shown in Fig. 2, while the wheels, axles, springs, and other parts of the chassis were removed. As several



ILLUSTRATING USE OF FIXTURE AS CAR SUPPORT. FRONT AXLE REMOVED

BENT STEEL RODS FOR USE IN SUPPORTING CAR

Steel Hooks, Attached to the Walls of a Garage at Several Places, Serve Very Satisfactorily as Supports When Working on the Car Chassis

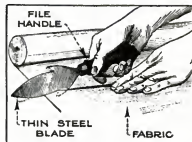
cars could be suspended at one time, it was possible to do much more repairing than before these fixtures were used.

They can easily be installed in a garage already built by cutting holes through the walls for large eyebolts, as indicated in Fig. 4, and fastening them with large washers and nuts.

Tire Repairman's Fabric Knife

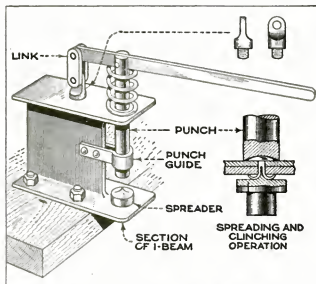
While intended primarily for tire repairmen, for use in cutting up cotton tire fabric, a knife of the type illustrated can be used with equally satisfactory results in cutting linoleum, artificial leather, and other materials. The blade is made of tempered sheet steel, in the form illustrated, and fitted with a file handle.

In use, the material being cut is placed on a flat surface, and the knife is pushed along the line to be cut, the edges of the cut being held down behind the knife.



Relining Brake Bands

The fixture shown in the illustration will facilitate the work of inserting,



A Fixture for Inserting, Spreading, and Clinching Rivets Used in Relining Brake Bands That Greatly Reduces the Time Required for This Operation

spreading, and clinching the bifurcated rivets used in relining brake bands.

The frame is made from a short length of I-beam, with the web cut away at one end. A tool-steel anvil, machined to the shape shown, is driven into a hole drilled in the bottom flange, to serve as a spreader, and, directly in line with the center of the latter, a hole is drilled in the upper flange for the punch.

The punch is turned concave at the lower end, to fit the rivet heads, and is guided by a flat-iron guide riveted to the web of the frame. It is pivoted to the hand lever, which is, in turn, pivoted between two links that swing on a stud screwed into the upper flange of the I-beam. A strong coil spring is placed over the punch between the upper flange and the lever, to lift the punch automatically after the rivet is clinched.

The fixture is bolted firmly to the work-bench, and will reduce, by almost half, the work required on brake bands.

Ship Tonnage

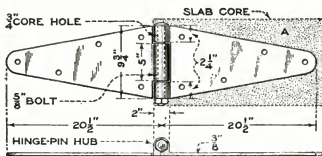
The question is often asked, "What is the meaning of the various terms used in speaking of ship tonnage?" Briefly, there are four kinds of tonnage terms used afloat—dead-weight tonnage, displacement tonnage, gross tonnage, and net registered tonnage. Dead-weight tonnage is the weight that the vessel can actually carry in tons of cargo, plus stores and bunker coal, or oil in the case

of an oil-burning vessel. Displacement tonnage is the weight of the water that a ship displaces when floating full of cargo, and is equal to the weight of the hull, plus the dead-weight tonnage. The weight of the water displaced by a body is, of course, exactly equal to the weight of the body. Gross tonnage is based on the cubic contents of the hull, 100 cu. ft. of inclosed space making 1 ton. Net registered tonnage is gross tonnage with the crew and machinery spaces deducted; that is, it is a measure of the space actually available for carrying cargo. Gross tonnage is often called register tonnage, because it is recorded in the Register of Merchant Vessels of the United States. A ton, nautically speaking, is always the long ton of 2,240 pounds.

Making Patterns from Dry-Sand Cores

A foundryman had to hang a pair of heavy gates in his plant, and as no hinges were at hand sufficiently heavy for the purpose, he used an interesting method of making a pattern in order to cast the hinges. No lumber being available from which to make the patterns, he made them from dry-sand cores.

The outline of the hinge was traced on a slab core, A, the core cut to shape with a hacksaw, and finished with a file. The hinge-pin hubs were cut and shaped from square cores, then pasted in place on the hinge-plate slabs. When finished, the patterns were carefully placed on a bottom board, and the molds made in the



Pattern for Heavy Steel Hinges Made from Dry-Sand Slab Cores; a Simple Method for Single Jobs, Where Accuracy Is Not a Factor

usual way. Five-eighth-inch stud cores were pressed into the drag, to make the holes for the $\frac{1}{2}$ -in. bolts used to fasten the hinges to the gate, and $\frac{3}{4}$ -in. cores made the holes for the $\frac{5}{8}$ -in. hinge pin. The castings were made of steel.

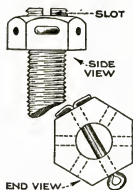
☐ The temper is drawn from hardened brass by heating to a cherry red and plunging it into water.

Screw Pipe Joints

In spite of many persons' belief to the contrary, it is the "dope" that makes a pipe joint tight. If a joint is made without first coating the threads, it will certainly leak, and if proper jointing material is applied, it will stay tight. Another common fallacy is that the compound should be applied to the female thread; it should be applied to the male thread, for otherwise some of it is likely to be pushed into the pipe, where it hardens and forms an obstruction—a serious defect in a long line.

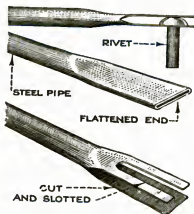
Aligning Holes in Castellated Nuts

While fitting a new connecting rod in my car, I found difficulty in aligning the castellations on the nut with the pinholes in the bolts. After several attempts, I sawed a slot in the bolt, and drilled three holes in the nut, as in the drawing. This is the opposite of the usual practice, but I found it much handier, as the holes in the nut and the slot in the bolt can be seen at all times. An additional advantage is, that there is no need to use two wrenches should the bolt turn while being tightened, as a screwdriver can be used in the slot while turning the nut with the wrench.—Irving R. Butler, Forestville, Conn.



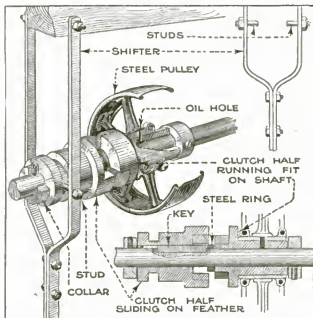
Holder for Handling Hot Rivets

Setting small hot rivets in place with tongs is not very satisfactory, owing to the difficulty of grasping the button head properly while inserting the stem into the hole. This results in dropping many rivets and makes progress slow. The holder shown was found to be successful in practice. It is made of thin steel tubing, cut and bent as shown.



Making a Jaw-Clutch Pulley

The jaw-clutch pulley is well adapted for use in small shops, and other places



A Jaw Clutch for the Small Shop, or Other Place Where Power from a Single Lineshaft is Used to Operate More than One Machine

where power for more than one machine is taken from a single lineshaft. The only trouble is that it is comparatively difficult to obtain, as only a few firms list it. The drawing shows how a strong and simple jaw-clutch pulley may be made in the shop.

A standard jaw-clutch shaft coupling is used, and the hub of the stationary half is turned to fit the bore of the pulley used, the latter being clamped to the turned hub, and the whole running loose on the shaft. The sliding half is keyed to the shaft and is prevented from sliding off the key at the rear by a safety set collar. Between the two halves of the coupling and in front of the key, a steel ring or washer is placed; this prevents the loose, free-running half from shifting against the key. A safety set collar is also used to hold the loose half in position on the shaft. An oil hole should be provided for the pulley half of the clutch, and an oil groove should be chipped through the bore to assist in spreading the lubricant over the whole bearing surface.

A simple yoke lever for shifting the clutch can be made of $\frac{3}{8}$ by 2-in. flat iron. Three-eighth-inch capscrows, with their heads cut off, make good studs for running in the groove; when worn thin, the studs can be easily replaced by others of the same kind. The cost of such a clutch is considerably less than that of a good friction clutch.



A MOTOR-DRIVEN JIG SAW

By J. V. ROMIG



THE jig saw, as a woodworking tool in the pattern shop, is used mostly for work too large to be swung on the band saw. It is also used for interior cut-outs, where a hole is first drilled in the work and the saw blade inserted in it.

The machine described in this article will be a very valuable addition to any small woodworking or pattern shop, as there is no limit to the variety of work that can be turned out on it. Furthermore, as it is motor-driven, many of the objectionable features of the older designs, such as slipping belts and rattling countershaft, are eliminated.

The main frame of the machine consists of a base and column cast in gray iron, with the motor base and the table-adjusting screw bracket cast integral with it. The pattern is split on the line of the front face of the column, and the casting, with sufficient draft, will pull easily out of the sand. There is very little machine work necessary on this piece; the seat for the lower slide, as well as the lower pivot-arm bosses, are shaped square, and the necessary drilling and tapping, such as the holes for the adjusting screw and crank-bearing bolts, motor-support slots, and lag screws, is then done.

The table is also cast from a simple pattern, and has two ribs extending lengthwise across the bottom. The upper pivot bosses form part of these ribs. The table is planed down to about $\frac{7}{8}$ in. thick, and should be made straight and true. The pivot bosses are drilled square with the top surface, and after being aligned with the bosses on the frame, are held in place by bolts or pins. It is best to drill the holes in the bosses a little undersize, and ream to size while the table is blocked in position, to insure that the pins will fit properly.

The crankshaft is built up of a 5-in. machine-steel disk, a $\frac{5}{8}$ -in. crankpin, and a $\frac{7}{8}$ -in. shaft, the pin and shaft being welded, or brazed, and pinned in holes drilled through the disk. The crankshaft runs in two small pillow blocks bolted to the frame, and is kept in place by the crank disk and the outer pulley.

The pitman, which is preferably made

of oak, is drilled and split at one end, as shown, to fit the crankpin, and is held in place by means of a washer and flat-head screw. The adjustment of this bearing for wear is made by means of a clamping screw that passes through the split end. The upper end of the pitman is fitted with two $\frac{1}{4}$ by $\frac{3}{4}$ -in. metal strips, forming a yoke for the bottom of the lower slide, and is connected to the slide by a $\frac{1}{16}$ -in. wristpin.

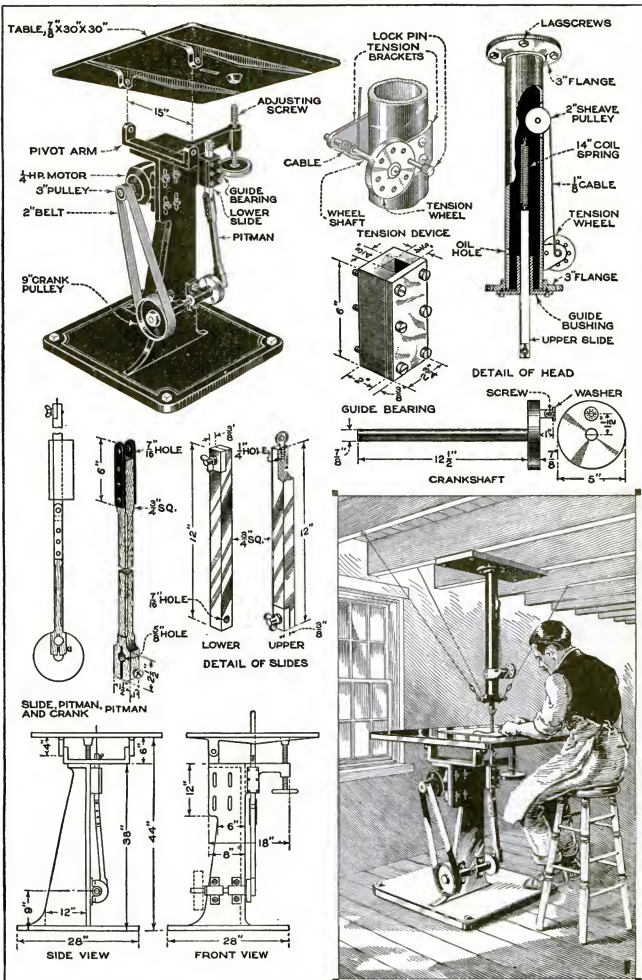
The guide bearing for the lower slide is made of cast iron; a groove, $\frac{3}{4}$ in. square, is cut in it, as shown, and made a good fit on the lower slide. A steel plate is fitted to the bearing as a cover, and the whole is screwed to the frame with 6 long fillister-head screws, passing through both units.

Both upper and lower saw slides are made of cold-rolled steel, $\frac{3}{4}$ in. square, filed true and polished. After drilling a $\frac{1}{4}$ -in. tapping hole at one end of each slide, a small portion of the end is cut out as shown. The parts cut out are drilled $\frac{1}{4}$ -in. clearing size, and by passing a thumbscrew through both sections, a vise is formed for holding the saw blade. A $\frac{1}{16}$ -in. hole is drilled in one end of the lower slide to receive the wristpin. The upper end of the other slide is drilled and tapped, as shown, for a $\frac{1}{4}$ -in. eyebolt.

The upper part of the machine consists of a length of 3-in. pipe, fitted with a flange on each end; the upper flange is fastened to a beam or crosspiece overhead, and the lower one has holes drilled near the edge for guy wires, each of which is fitted with a turnbuckle. An oil hole is drilled through the side of the pipe to permit oiling of the slide.

A guide for the upper saw slide is made by broaching a $\frac{3}{4}$ -in. square hole in a cast-iron bushing. This bushing is then fitted into the pipe and screwed to the lower flange.

The end of a heavy coil spring is fastened to the eyebolt on the upper slide, and from the upper end of the spring a $\frac{1}{8}$ -in. steel cable, running over a 2-in. sheave fitting in a bracket in the wall of the pipe, is led to the tension device. This device, a winch arrangement, is a great



This Jig Saw will Prove to Be a Valuable Addition to the Equipment of Any Small Woodworking or Pattern Shop, as a Great Variety of Work can be Turned Out with It. It is So Designed That Many of the Objectionable Features of Older Models are Eliminated

improvement upon the older models that use a long threaded rod reaching through the floor above. It consists of two steel plates, screwed to the pipe, a $\frac{3}{4}$ -in. shaft, a handwheel, and a lock pin. A hole is drilled through the shaft, so that the end of the cable can be passed through and knotted, to prevent it from slipping. When the handwheel is turned sufficiently, and the lock pin put in place, the spring is put under tension, and the saw blade held tightly. In operation, the pitman pulls the saw blade downward, and the spring pulls it up again. The tension must not be too light, or the blade will be bent and broken. This device is very convenient when inserting new blades. Blades 8 in.

in length will answer very well for most work. The pivoted table makes it possible to cut any desired draft angle in the work. The adjusting screw is of cold-rolled steel, $\frac{7}{8}$ in. in diameter; it should be equipped with a lock pin or screw to prevent it from being turned accidentally.

A $\frac{1}{4}$ -hp. electric motor, of about 1,750 r.p.m., fitted with a 3-in. pulley, is fastened to the frame by bolts, passing through the slots cut for this purpose. The crankshaft pulley, which is fastened in line with the motor pulley, is 9 in. in diameter, and a 2-in. endless fabric belt, of single thickness, is used for the drive. A snap switch can be mounted in a convenient place underneath the table.

Shoveling Stand for Corn

The shoveling stand illustrated is a great convenience to the farmer, as with



A Handy Homemade Stand for the Farm, for Use in Unloading Corn from the Wagon: A Stand of This Type Prevents Waste of Time and Corn

it he can start unloading corn with a shovel as soon as the wagon is backed up to the crib. A frame, of 2 by 4-in. lumber, 5 ft. long, and as wide as the wagon box, is made and covered with 1-in. boards, to form the platform.

Pieces of 2 by 4-in. lumber, or other suitable material, are used for the legs, and any rough boards will serve for the sides. The side members of the frame should extend far enough to rest on the rear sill of the wagon.

Fruit Trees Injured by Winter Sun

Many young fruit trees are lost every year through lack of foresight. Winter sunshine is responsible for a large percentage of losses that are frequently laid to other causes.

The low temperature of the winter months drives the sap down into the

roots, leaving the tree itself in a dormant state. On a bright sunny day the bark becomes warm, and this draws the sap up into the trunk, where it freezes during the night, before it has time to get back to the root. In freezing, the sap expands, which splits the bark and causes severe injury to the tree.

As a precaution against this danger, the trunk should be wrapped with tar paper, or some similar material, to deflect or absorb the sun rays, thereby maintaining a more constant temperature.

Reducing Pulpwood Decay by Proper Storage

Improper storage conditions at pulp mills are primary causes for pulp losses, which sometimes mount as high as 400 lb. per cord of wood, in addition to inestimable losses through the manufacture of poor qualities of paper. Pulpwood is generally piled directly on the ground, which is usually poorly drained and overgrown with weeds. Some wood is also allowed to remain in storage for several years, because it is not used in rotation.

In order to prevent this unnecessary decay, it is recommended that the logs be peeled, if possible, as this prevents borers from attacking the wood, and also hastens air-drying. In the storage yards, soil moisture should be reduced, through proper drainage, and weeds should be kept down. This can easily be accomplished by filling in the yard with cinders. The wood should not be piled directly on the ground but on stringers, supported by concrete piers or creosoted-wood blocks. The stringers should be pressure-treated with coal-tar creosote. The piers or blocks should be high enough to raise the stringers at least 12 in. from the ground

and thus allow proper ventilation. Marking each pile with the date that the logs were received will aid considerably in using up the wood in rotation. Upon removal of the pile of wood, the accumulated waste should be burned, lest it be a source of infection for fresh wood. All infected skid logs should be removed. Where timber is placed in conical piles by conveyors, a possible remedy may be to keep the wood saturated with water by means of an overhead sprinkler system. Wood saturated with water will not rot because there is not enough air within the timber to allow the fungi to grow. Whether it is commercially possible to wet the piles sufficiently and maintain them in this condition, must, however, be demonstrated by actual test.

Hauling Sorghum Cane

In the Southwest sorghum cane is the principal feed crop, and is usually stacked in small piles for two or three weeks before being stored in large stacks.

Hauling the cane with a frame wagon during these operations means double handling, and for this reason, some farmers use the simple skid shown in the photograph to haul the cane. Its width



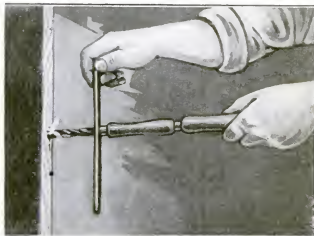
A Simple Skid Used by Farmers to Transport Sorghum Cane: Much Handling is Saved by the Use of This Simple Device

is 10 ft., and the three pieces of 2 by 4-in. stuff that form the main skid members are 5½ ft. long. These pieces are connected, at the rear, by a frame made of the same material, braced as indicated, and are beveled on the front ends, to ride easily over the ground.

A ring is fastened to the frame, on each side, and in use, a 7-ft. trace chain, with a singletree, is attached to each ring. The traces are led forward, parallel with the skid members, and the reins adjusted to allow the horses or mules to "broad-walk." The pile of cane is then "scooped" on the skid, and dragged to the stack.

An Emergency Wood-Drilling Tool

When no brace and bit are available, a very satisfactory substitute can be improvised from an ordinary twist drill, a tap



An Improvised Wood-Drilling Tool That Makes a Very Satisfactory Substitute for a Brace and Bit, When the Latter Are Not Available

wrench, two file handles, and a short piece of ¼-in. steel or iron rod.

The twist-drill shank is ground square, and tapered for such a length that, after the tap wrench is fitted on, the end will still project far enough to be inserted securely in the file handle. A hole, 3 in. deep, is drilled lengthwise into the top of this handle, to receive a 5-in. iron rod, that fits loosely in the hole. A metal disk is inserted into the bottom of the hole to take the thrust. The rod is then fastened securely into a hole drilled in the other file handle, allowing about 3 in. to project. The outer handle can then be held firmly in the left hand, and will not turn, while the other part of the tool is being turned by means of the tap wrench.

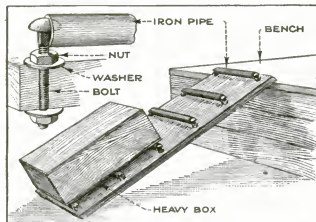
Removing Broken Screws

When a screw breaks off flush with the surface of the part into which it fits, the usual method of removing it is to back it out by means of small chisels, or drill it out. The following method should be tried first, however:

Sharpen a twist or flat drill, so that it will cut when the drill press is reversed, allowing a little more clearance than usual, in order that the point may have a digging effect. After the drill is placed in the chuck, and the machine reversed, the drill point should be brought down against the broken screw by a quick movement of the spindle. By this means the screw will be released, if it is soft enough to allow the drill point to catch in it.—L. M. Steffen, Dayton, Ohio.

Handling Heavy Boxes

While most shops possess facilities, such as trucks, etc., for transporting boxes of heavy material around the plant,



A Method of Reducing the Labor Required to Elevate Heavy Boxes to the Workbench, by Means of an Easily Built Skid

very few have provided any particular means of placing the boxes on a workbench, when necessary. With the device shown, which can be made at very small cost, one man can roll a heavy box onto the bench, a task that would ordinarily require the services of two or three men.

A 2 by 12-in. plank, a number of $\frac{3}{8}$ -in. round-head bolts, with nuts and washers, and some $\frac{3}{4}$ -in. piping, are the only materials required. Material of larger or smaller size can, of course, be used where necessary, taking care, however, that the radius of the bolt heads is suitable for the internal diameter of the pipe used. The plank is drilled on each side to take the bolts, at suitable intervals, the piping is cut into lengths, and the edges are rounded. When assembling, two bolts, with upper nuts and washers in place, are placed in opposite ends of a length of pipe, the assembly is placed in position, the upper nuts are adjusted for height, and the bottom nuts run on and tightened. The end nuts, at the top and bottom, prevent the device from moving when a box is being pushed up onto, or lowered from, the bench. If kept well greased, the pipe rollers run very easily.

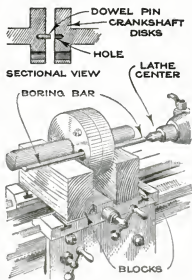
Making Babbitt Run Freely

After considerable experimenting with different methods, it was found that a handful of sal ammoniac, dropped into the ladle of melted babbitt just before pouring, made it run much more freely and resulted in a smooth job, free from lines. A piece of resin, about the size of a walnut, has the same effect.

Repairing Crankshafts

Repair jobs are always the most difficult of machine-shop work, as the shops making a specialty of this work are not usually so well equipped to repair a part of a machine as the factory making the part. One of these tough jobs consists in putting a new pin in a center crankshaft, one that has cast-iron disks with the pin and shaft pressed in. By the time the pin has loosened enough to be replaced, it has worn out the holes in the disks so that they must be rebored. These holes must be bored exactly parallel with the shaft in both directions, and be precisely the same distance from the center of the shaft. If these conditions are not fulfilled, the shaft will run out of true when the pin is inserted.

Both ends of the shaft are put in the lathe, and the faces of the disks trued. At



the same setting, with the shaft running in the steady-rest, a hole, about $\frac{3}{4}$ in. in diameter, is bored true in the center of each part of the shaft; this is for a dowel pin to hold the two parts together in perfect alinement. Next, two or three holes are drilled through the disks, so that they may be bolted together with the two dowel holes in line, the dowel holding them centrally, and the trued faces insuring that both shafts are in line. Two wooden blocks are bolted to the lathe carriage; these are of such a height that the center of the shaft will be about the same level as the lathe center. The two shafts, bolted together, are put on the blocks, and clamps are arranged to hold them in place. A boring bar is put between centers, and the holes to be bored are trued up approximately. The bed of the lathe is tested for level, and the shaft adjusted to correspond. This makes the shaft parallel with the bar on one plane. Caliper between the bar and ends of the shaft to the same distance at both ends, that is, if the ends of the shaft are of the same size; if they are not, the necessary allowance must be made.

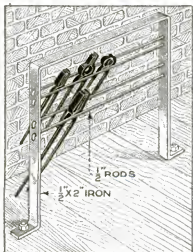
Now, the shaft is exactly parallel with the bar, and when the holes are bored, they will be both the same distance from the center of the shaft and parallel to it.

The only remaining requirement for a perfect job is to put in the pin and still have the centers of both shafts coincide. Before the disks are taken apart, a keyseat is cut through both disks at the same time. This can be done most accurately on the planer, supporting the shaft on V-blocks. The pin is turned up, and a keyseat milled on both ends at the same setting; keys are made, and the shaft is ready to press together. If a reasonable amount of care is taken to see that the keys do not shear in pressing together, the shaft will run perfectly true, but if the keys are allowed to shear, an error will be present in the finished work.

An Improved Tong Rack for Blacksmiths

Since using the rack shown in the drawing, it has been possible, in a smith shop employing a number of men, to keep the tongs in a manner at once convenient, orderly, and safe.

Usually the tongs are held on a horizontal rail near the water trough, and because the jaws are forced open by this rail, it becomes necessary for the workman to lift several tongs before finding a pair that will fit the work, thus losing considerable time. In making the selection,

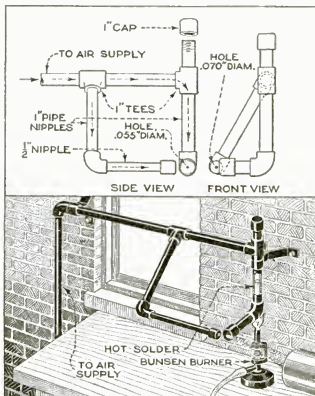


and less danger of burns, as the tongs must be grasped by the jaws to insert them between the bars of the rack, and this compels each workman to cool his tongs before returning them.

Arranging the smaller tongs at the top, and the larger ones at the bottom, will prove of additional assistance in eliminating lost time, as a suitable pair may be selected at once.

A Simple Device for Pulverizing Solder

Pulverized solder, which is not easily obtained at all times, can be made by a simple apparatus constructed almost en-



A Simple Device, Made of Pipe and Fittings and Using Air, to Pulverize Melted Solder, Which may be Used to Make Self-Fluxing Solder

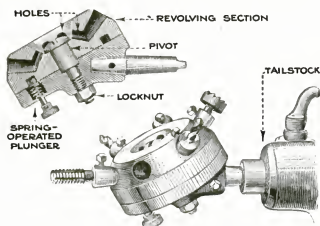
tirely of pipe and fittings, as shown in the drawing.

Melted solder is poured into the vertical pipe, after a small wooden plug has been inserted into the .055-in. hole shown, to keep the solder from running out. A Bunsen burner or gasoline torch is used to keep the solder in a molten condition while in the pipe. Having screwed the cap down tightly, the air, which should be at a pressure of about 50 lb. per square inch, can be turned on, and the plug withdrawn. The result is that the solder, forced through the small hole, is broken up into very fine particles, and at the same time cooled, by the strong jet of air directed against it through the .070-in. hole in the air nozzle. The particles of solder can be caught in some receptacle placed in the position shown.

A very good self-fluxing solder can be made by mixing this pulverized solder with vaseline and a little zinc chloride. If a self-fluxing bar is desired, mix the solder with powdered resin and glycerin to form a stiff mass, which can be rolled into bar form, and used like ordinary bar solder, but without a separate flux.—L. M. Case, Anglesea, N. J.

Lathe Turret Held in Tailstock

The drawing shows the construction of a turret toolholder for the tailstock of a lathe, the turret holding six different



Turret Fixture Held in the Tailstock Spindle of an Ordinary Lathe: The Toolholder is Mounted So That the Tool in Use Is Exactly in Line with the Center of the Work

tools. This fixture was designed for use on an ordinary back-geared engine lathe, but the same thing could be adapted for a wood-turning or speed lathe.

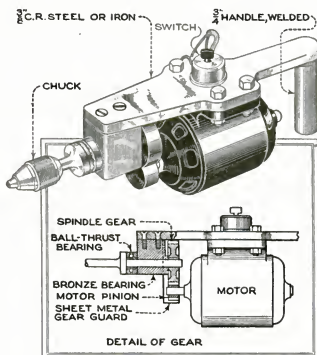
The fixture consists of a circular plate supported in the tailstock spindle by means of a standard taper shank. At the center of this plate, which is tilted at an angle, is a fixed stud that keeps the tool-holding section in place. The toolholder is free to revolve, and is held in any one of the six positions by means of a spring-operated plunger on the underside of the fixture. The entire device is placed at such an angle to the center that the tool being used will be exactly aligned with the lathe centers. The openings for the tools are machined by tools held in the chuck of the lathe, in order to obtain correct alignment, and are tapered for standard taper-shank tools, or collets. By setting up as many tools as required in this fixture, it is possible to perform drilling, tapping, threading, facing, counterboring, and countersinking without the loss of time occasioned by using individual tools.

How to Make an Electric Drill

There is no handier tool in the workshop or laboratory than a small electric drill, but unfortunately its high cost puts it beyond the reach of most. A very serviceable tool of this type can be made from an electric motor of from $\frac{1}{10}$ to $\frac{1}{8}$ horsepower.

For these small motors, a chuck with a capacity up to $\frac{1}{4}$ in. should be used, and the drill speed should be about 600

r.p.m.; the motor speed is reduced by means of simple gearing, as illustrated. The motor is mounted centrally, on a cold-rolled steel frame, with capscrews, and it should be doweled in place. On the forward end of the frame is mounted the bearing block, two flat-head machine screws being used to fasten it to the frame; this block is drilled for the spindle shaft, and is of bronze, which makes a fine long-wearing bearing. On the spindle, which is made of cold-rolled steel, casehardened, a collar is turned that rides against the ball-thrust bearing. The reduction gear is fastened to the inside end of the chuck spindle, and the pinion to the motor shaft. These gears can be bought from stock, and 20-pitch gears should be suitable for this light drive. A brass pinion, running on a steel gear, will make a well-wearing assembly. Care should be used in the assembly, so that the teeth will mesh properly. A handle, made from a suitable length of $\frac{3}{4}$ -in. pipe, is welded to the rear end of the frame. A well-balanced tool results from the underslung mounting of the motor, making the use



A Fractional-Horsepower Electric Motor, Adapted to Make a Serviceable and Satisfactory Drill That will Serve as Well as an Expensive Tool for Light Work

of the tool safe and easy. A sheet-metal guard is fastened over the gears, as shown, with small screws; this is necessary, not only to keep drill chips from getting between the teeth, but also to prevent injury to the operator. If desired, a simple snap switch can be mounted on the flat top of the frame, as shown, for controlling the operation of the motor.

How to Make an Electric Muffle Furnace

"Kromore" or No. 17 Alloy Wire

BY CHAS. E. MULLIN

Harmon
Co.
Harrison
N.Y.

ONE of the most useful pieces of apparatus for general experimental and shop work is an electric muffle furnace. As these are rather expensive to purchase, although they are comparatively easy and cheap to build, I build my own. A furnace of the type described has been in hard use for over a year in my own laboratory, and has given entire satisfaction. The only precaution necessary to observe in its use is to avoid temperatures higher than about 1,800° F. It operates on alternating current of 110 volts, but will work equally well on direct current. It will reach a temperature of 1,800° in about two hours, on a 5-ampere current, which means a total cost of about 14 cents, at the rate of 12 cents per kilo-hour.

The muffle was purchased from a laboratory - supply house. It is a D-shaped alundum muffle, 4.5 in. long, 3.5 in. wide, and 3 in. high. These muffles may be obtained in various sizes. In case a cheaper unit is desired, a fire-clay muffle may be used. For the heater winding, about 110 ft. of No. 17 "kromore" wire or ribbon is used. Wind the muffle as shown in the upper figure, securing the ends of the wire in place with tie wires. If the furnace is to be used for a variety of work, tap the winding near one end. This avoids the use of a separate rheostat or other resistance, in many cases, while, if an outside resistance must be used, a much smaller one will do, than if the taps are not provided. The taps cannot be soldered to the wire, on account of its high temperature when in use; it is best to double and twist the wire at the tapping points, allowing enough of the doubled wire to reach the binding posts, before proceeding with the winding. If ribbon is used, it is doubled, and the doubled portion, close to the muffle, secured with a small clamp, or a wire tie.

Both ends of the muffle should be

wound somewhat closer than the middle, especially at the open end, and the taps should be taken off starting at the latter, so that the back of the furnace will always be hottest.

When the winding is in place, cover the whole muffle outside with a stiff layer of alundum cement, about $\frac{1}{8}$ to $\frac{1}{4}$ in. thick. Allow the cement to dry for about 24 hours in the air. Then put it in a warm place; for instance, above a furnace or stove, for another 24 hours. Next bake it for 5 or 6 hours in an oven, to drive out all moisture. If any small cracks develop in the muffle after baking, fill them up with thin alundum cement.

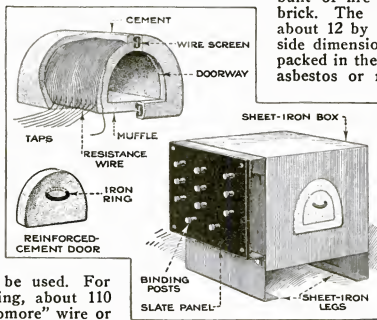
If the furnace is to be permanently set in one place, an excellent casing can be built of fire brick or common brick. The casing should be about 12 by 12 by 12 in. in inside dimensions. The muffle is packed in the casing with waste asbestos or magnesia, such as used for pipe covering. As my laboratory is small, and I must move the furnace out of the way when not in use, I made a 12 by 12 by 12-in. sheet-iron box for it, as shown.

The inside of the arched doorway has the same height, width, and shape as the inside of the muffle.

The walls are $\frac{3}{4}$ in. thick and built around coarse wire-screen reinforcing, as shown. The doorway is 4 in. high.

The door is a solid block of alundum cement, reinforced with wire screen, and fits loosely into the doorway. It is provided with an iron-ring handle, set into the face, as indicated. After molding, the door and doorway are dried in the same way as the muffle. All surface cracks are filled, and the outside smoothed on a grinding wheel. The inside of the doorway may be smoothed, before it gets too hard, with a coarse file. The doorway is held in place by the sheet-metal casing and by the magnesia packing.

The taps from the heating coil are



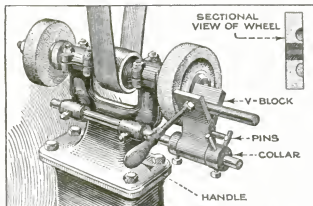
Upper Left: Winding of Muffle, Cement Covering, and Construction of Doorway. Lower Left: Muffle Door. Right: The Complete Furnace, Showing How the Panel and Legs are Attached to the Casing

Muffle Central Scientific Supply Co.
460 E. Chicago St., Chicago

brought out through the side of the casing, and are insulated with asbestos board. They are attached to binding posts on a slate panel, fastened to the side of the casing by sheet-iron straps, as illustrated. The casing is supported by sheet-iron legs, riveted to the sides.

Attachment for Squaring Stock on Grinder

Using small and easily made attachments, an ordinary bench grinder can



An Attachment for Grinding Wheels Illustrative of Similar Devices that can be Used in Place of the Standard Tool Rest

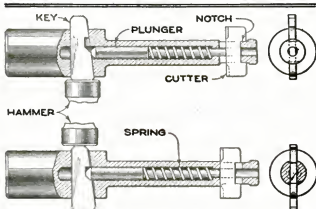
be rigged up to do more than the usual simple grinding operations. One of the jobs frequently met with in the shop is the squaring of the ends of stock previous to centering, as the hacksaw or parting tool generally leaves a burr and a rough surface which it is desirable to remove. As most grinder heads are designed with a T-rest for supporting the work, the rest can be removed and the bearings used to hold the attachments. In the case of the fixture illustrated, the V-block is a casting, which is prevented from moving horizontally by two collars, fastened to the shaft with setscrews. The outer collar is provided with two stop pins, and the swinging V-block has its movement limited by a pin inserted into it parallel with the shaft. A handle attached to the front face of the V-block allows the whole fixture to be swung back and forth, carrying the work across the face of the grinding wheel.

A Reverse Counterbore

The plant that uses the counterbore illustrated finds it necessary to drill several holes through a casting into a recess, and to spot-face, or counterbore, the bottom surface. Several different types of counterbores were tried, but this one has proved to be the best, as the cutters sel-

dom break, and the bars, with proper usage, will last a long time. It has the added advantage that there is nothing to lose out of the bar once it is assembled, as the key can only be removed by pushing the plunger down with a flat, pointed piece of steel, inserted through the hole in the upper end of the bar. There is, however, no necessity for removing the key unless the bar should break. The cutter is notched, the notch being a sliding fit over the smallest part of the bar. Small grooves or notches are also cut in the bar. They can be filed or milled easily and hold the cutter in a central position. The cutter is made a sliding fit in the slot that accommodates it, the slot being made slightly wider than the cutter, but very little, say, about .01 in. The key shows the position of the cutter at all times, so it is not necessary to look under the work to find its position. The bar is made from a good grade of common steel, casehardened. The plunger, cutter, and key are made of tool steel, hardened.

The upper drawing shows the counterbore ready for use. The taper key is tapped into position with a hammer, bringing pressure to bear on the plunger. The spring is slightly compressed, and the cutter is held down firmly; the bar is then brought up and the hole spot-faced, or counterbored. The lower drawing shows how the cutter is released by tapping the key in the opposite direction, so that the pressure against the cutter is

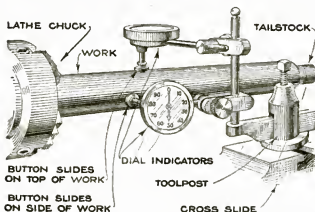


An Efficient Counterbore That Has No Loose Parts to Drop Out: This Tool is Designed for Spot-Facing, or Counterboring, the Underside of Drilled Holes relieved, making it easily removable.—Galen D. Watson, Bath, Me.

¶The speed of a revolving toothed cutter is governed by the material to be milled or cut; generally, the harder the material, the slower the cutter runs, and the lighter the feed.

Testing Work in Lathe

When it is necessary to set a piece of work in a lathe accurately parallel with the line of travel of the carriage, and with the lathe bed, the custom is to use a dial, or other indicator, clamped to the toolpost, first sliding it along the side of the work, adjusting this until the indicator shows parallelism, then shifting it to the top and adjusting the work vertically. The second adjustment often throws out the first one, requiring much trying to set the work parallel both ways. A better method, in which two dial test indicators are used simultaneously, is shown in the drawing; one contact point slides along the side and the other along the top of the work, one end of which is centered and runs on the tailstock center, while the other is held in a four-jaw independent chuck. In this instance the



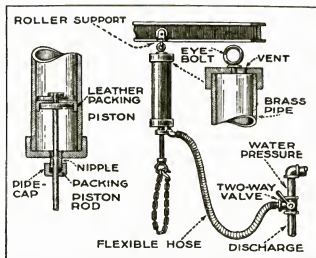
Testing Work Held in a Lathe Chuck for Parallelism by Means of Two Dial Test Indicators, Which Show Top and Side Adjustments Simultaneously

work was not to revolve in the lathe, but was to be held stationary while a keyway was cut by a toolpost milling attachment; the bar was adjusted by shifting the jaws of the chuck slightly. When using two indicators, if one adjustment throws the other out, the fact is noticed, and a correction made at once, without waiting to change the position of the dial.

Hydraulic Shop Hoist

Practically every shop is provided with water mains delivering water at pressures of from 40 to 80 lb., and the drawing shows how this pressure can be applied by means of a hoist to the lifting of heavy work. The cylinder can be made from a piece of pipe, about 6 in. in diameter. This is fitted with a piston, made from a cup-shaped piece of leather which is clamped on the piston rod between two metal plates. The lower plate should be screwed on the rod, and the upper one

an easy fit. A simple stuffing box, made from a large and a small pipe cap and a nipple, is provided at the lower end, and the upper end of the cylinder is closed



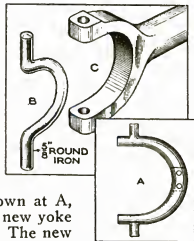
A Hydraulic Hoist for the Shop or Garage for Lifting Heavy Weights and Parts: The Whole Device can be Made from Standard Pipe and Fittings

with another pipe cap. The hoist is connected to the water-supply pipe as shown in the drawing, through a two-way valve. When a load is to be lifted, water is admitted to the cylinder, raising the piston and the object attached to the rod. When the load is to be lowered, the valve is turned to allow the water to run out of the cylinder into a drain, causing the weight to descend gradually and smoothly.

Repairing a Tractor Clutch Yoke

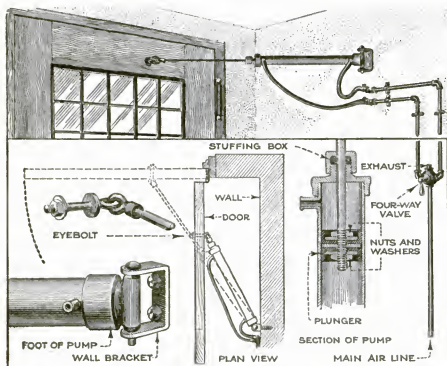
In the midst of wheat-seeding operations, the yoke of the speed-shifting device of the tractor, which had become worn, broke.

As the part was a malleable-iron casting and could not be welded at the forge, the two broken pieces were riveted together, as shown at A, to serve until a new yoke could be made. The new yoke was made from a piece of $\frac{3}{8}$ -in. round iron, as shown at B, forging it to conform to the old part. Then it was heated and fitted into the yoke arms C, so that it would work in the grooved pinion.—G. G. McVicker, North Bend, Neb.



Pneumatic Opener for Garage Doors

Heavy garage doors can be opened and closed by a mere twist of the wrist and



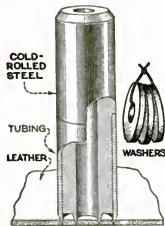
Arrangement for Opening and Closing Heavy Garage Doors by Means of a Pneumatic Cylinder Employing the Garage Compressed-Air Supply: A Four-Way Valve Makes It Possible to Control the Doors from a Distance

at a considerable distance away. Use is made of a pneumatic cylinder, for which the ordinary compressed-air supply of the shop will be sufficient. A single-cylinder

automobile pump can be modified for the purpose, or, if this is not sufficiently heavy or long enough, a cylinder can be made up easily from a piece of iron pipe and the proper fittings. Air outlets must be provided at each end of the cylinder, and double piston leathers are required; also, a stuffing box, made from a pipe bushing and cap, must be provided, to prevent escape of air through the piston-rod opening. One end of the cylinder is hinged to the wall, and the end of the piston rod is fastened to the door with an eyebolt, as shown. Hose connections are used for joining the cylinder to the air-supply pipes. For controlling the action of the cylinder, a four-way valve is necessary. A turn of the valve handle admits air to either side of the piston, depending on whether the door is to be opened or closed. The resistance caused in forcing the dead air on the opposite side of the piston through the exhaust allows the door to be opened or closed gradually.

Simple Washer Cutter

A simple tool for cutting leather or fiber washers, or small gaskets, is shown in the drawing. The outer cutter is made from a piece of seamless-steel tubing, and the inner one of cold-rolled steel. To cut a washer, a piece of leather is laid on the end grain of a block of wood, the punch placed in position, and, while holding the

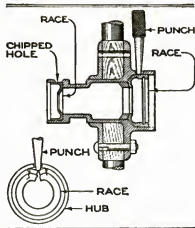


outer cutter down, the inner one is lifted a few inches, then brought down sharply. This drives both cutters through the leather, making the washer complete in one blow. The disks in the center are forced up through the hole in the punch.

Breaking Out Tight Ball Races

In some of the cheaper makes of automobiles the old cup-and-cone type of ball bearings is used in the front wheels, and if these bearings are run to destruction, it will be found that the outer races will spin up so tightly in their cavity that, when one attempts to remove them, the flange will break without in the least affecting the position of the races.

As there is no other way of removing the sticking part, drastic measures must be employed, and the drawing shows how the "seized" races may be broken out.



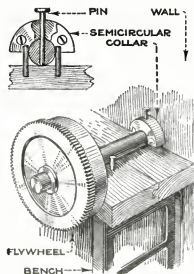
A sharp cape chisel, or a drill, is used to make a hole on either side of the hub, and as this is made of malleable iron, it is easily done. A stout punch is then inserted through the hole, and a few hard blows from a heavy hammer will suffice to break the race. The holes in the hub do not weaken it any, and as the race covers the inside, water cannot enter.

Fixture for Working on Flywheel Gears

Frequently, when working on the toothed rim of the flywheel from an automobile engine, there is considerable fitting to be done. As the work is too large and heavy to be held safely in a vise, some means must be provided for holding the flywheel, if the work is to be

done conveniently and in a minimum of time.

The drawing shows a fixture that has been used with satisfactory results in one repair shop. The wheel is supported beyond the edge of the workbench by a piece of shafting.

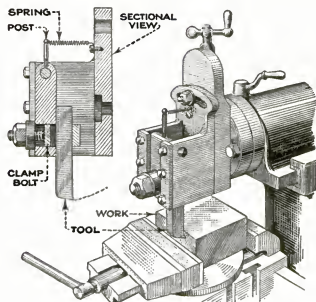


A circular steel collar is permanently fastened to the wall back of the bench. The piece of shafting that forms the support for the work is prevented from pulling out of the collar by a pin inserted through holes drilled in both pieces. Pins are inserted through holes in the bench on either side of the shaft, and prevent it from moving. When not in use, the fixture, with the exception of the collar, is removed, leaving the bench clear for other work.—E. N. Davey, Montreal, Can.

Making Shaper Cut on Draw

In order to shape work accurately to layout lines marked on the front, the special shaper head shown in the drawing was made and successfully used. The object was to have the shaper make the cut on the draw instead of on the forward stroke; as no burr or ragged edge, thrown up by the tool, will then appear on the front of the work, it is much easier to

work close to the lines. The attachment is in the form of a casting which has the general appearance of the regular shaper

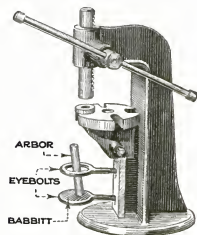


A Fixture for the Shaper, to Make It Cut on the Draw Stroke, Allows the Mechanic to Work Accurately to Layout Lines with Greater Ease

head, except that the sides are longer, to make room for the toolpost clapper box, which is, of course, reversed. A special toolpost is made which fits the opening in the apron and is tightened by a nut on the outside. A light spring is attached to the top of the box, to bring the tool down quickly at the end of the outward stroke of the ram. The back of the box rests against two plates fastened to the casting with capscrews. An arrangement of this kind is particularly handy for punch and die work.

Preventing Damage to Arbors

A handy attachment for the arbor press that prevents arbors from falling on a hard floor and thus becoming nicked and burred, is shown in the drawing. Two specially made eyebolts are screwed into the arbor press bed in line with the ram. The lower ring is filled with melted babbitt, and the upper one prevents the arbor from falling onto the floor.—Geo. H. Sloane, W. Bridgewater, Mass.



Handy Live-Stock Loader

Live-stock raisers and farmers will find the loader illustrated a very convenient one. It can be wheeled to any pen or



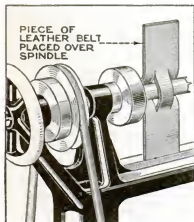
A Substantial Homemade Stock Loader That can be Moved to Any Point on the Farm

yard on the farm, thus making it unnecessary to provide permanent loaders at each point.

The loader should be from 30 to 40 in. wide, so that a large cow or bull can pass through it. Two-inch planks, 8 to 10 in. wide, should be used for the bottom of the runway, the lower ends being beveled parallel with the ground surface; 2 by 4-in. material for the framework, and common 1-in. boarding for the sides. The axle brackets should be well braced to the front legs, and a crosspiece put between the legs. A hook or clevis can be attached to this so that a horse can be hitched to the loader.

Chip Cleaner for Small Wood-Turning Lathe

The use of a blower on a small foot-operated lathe being impracticable, the



simple method shown in the illustration is applied by a mechanic in a small shop for cleaning the chips from the toolpost and bed. A piece of leather is slit, as illustrated, and pushed over the live spindle. When rotating, this will produce a current of air sufficient to blow the chips aside. As the cleaner is flexible, there is no danger in its use.

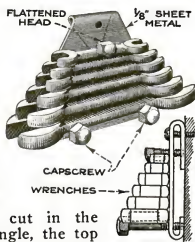
Marking Holes for Drilling

When laying out holes in one part of a machine, using as a template holes already drilled in another part, as must often be done in assembling, it is sometimes impossible to use a scribe, as, for example, when the holes already drilled are "blind." In such cases, the following method will prove of value: The holes already drilled are filled with powdered chalk, the upper part placed in position, and lightly tapped with a hammer. This leaves very distinct outlines of the holes, marked in chalk, on the underside of the piece, which is then prick-punched and drilled in the usual manner.—J. F. Knorr, Brooklawn, N. J.

A Novel Machine-Wrench Holder

Much annoyance and lost time are caused by failure to return borrowed wrenches belonging to some particular machine. This habit, unless checked, becomes chronic, and one finds, in shops afflicted with the borrowing habit, a deplorable condition, with machine operators continually inquiring the whereabouts of wrenches required at the moment. All this may be avoided by a little supervision, and the

use of a holder that practically compels the operator to keep the wrenches in an orderly manner. Sheet metal, about $\frac{1}{8}$ in. thick, is required for the body of the holder. It is cut in the form of a triangle, the top and bottom ends being turned back, as shown. Two holes are drilled and tapped in the bottom, and one at the top, to take hexagon-headed screws, and a plain hole, at the top, above the tapped one. The distance between the lower and upper tapped holes is determined by the total thickness of all the wrenches. These are piled as shown, the largest at the bottom. The upper screw head is filed away on one side, approximately flush with the threads, so that the wrenches can be removed when this side is down, but are securely locked in place when it is turned up. If one wrench is missing, it is, of course, impossible to



tighten the screw on the others to keep them in place. The holder is fastened at a suitable place on the machine, preferably near the tool tray, by a screw through the upper hole in the body.—Harry Moore, Montreal, Can.

Proofing Engravings Easily

Advertising men and business firms can take proofs of their engravings or "cuts" quickly and easily without a proof press. It is only necessary to place a sheet of paper on a piece of blotting paper, or similar material, with the carbon surface

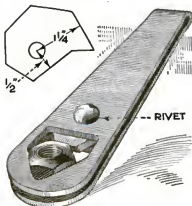


with the paper. The cut, from which the proof is to be made, is laid on the back of the carbon paper and given several sharp, firm blows with a mallet to transfer the design to the paper. This method, of course, is most effective with line cuts, but even with halftones, a better proof is obtained than can be obtained by the usual stamp-pad method.—Herbert Lang, Cincinnati, Ohio.

An Adjustable Socket Wrench

A handy socket wrench that will fit several different sizes of nuts and bolt heads can be

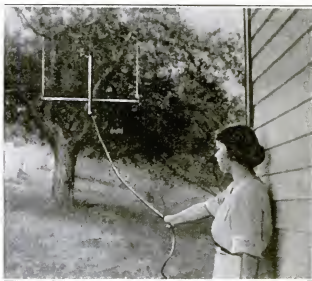
easily made from a piece of flat steel. The flat stock is bent over to form the main part of the wrench, and an opening, of the shape shown, is cut through the end. Between the two parts



of the wrench a piece of flat metal, cut to form a cam, as shown at the upper left, is riveted, so that, when turned, it will adapt the tool to nuts of different sizes. Each of the sides of the cam is at a different distance from the rivet hole. In use, two sides of the nut or screw head bear against the opening in the wrench, and a third against one face of the cam.

A Simple Farm Gong

The illustration shows the very simple gong in use on a farm to call the work-



Two Pieces of Iron Pipe, Suspended from the Branches of a Tree, Make an Excellent Farm Gong

ers from the fields. It consists of two pieces of 3-in. iron pipe, 4 or 5 ft. long. One piece is suspended horizontally, by two wires, from the branches of a tree a short distance from the porch, while the other is hung vertically, at the center of the first.

A cord, fastened to the bottom of the vertical pipe, runs to the porch, and when this cord is pulled and released, a loud tone is produced that can be heard clearly for over a mile. The pipes are painted with bronze paint, to prevent rusting.

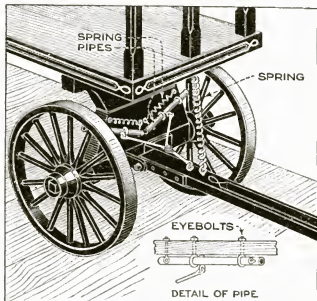
Tongs for Placing Bolts

A practical tool for placing bolts in places that are hard to reach can be made from an old pair of blacksmith's tongs. The tips of the tongs are drawn out and bent as shown, to fit closely under and around the head of the bolt.—H. J. Engel, New Braunfels, Texas.



A Truck-Wheel Lock

The device shown in the illustration is designed to prevent four-wheeled trucks from rolling off platforms. It is easily



A Simple and Positive Method of Locking the Wheels of Baggage Trucks, to Prevent Them from Rolling off Platforms

made, and has proved much more convenient than the common hook and chain.

The locking members are two short lengths of pipe, held at an angle on the front of the axle bracket by eyebolts, in which they slide. The pipes are of such a length that, when the inner ends touch, the outer ends clear the spokes by about 1 in. Riveted through each pipe are two eyebolts, as shown. To one eyebolt is attached a spring, the other end of which is fastened to the angle bracket.

The pipes are actuated by short iron rods, which hook onto the other eyebolts, and are jointed, as shown, to a third rod attached to the truck tongue. When the tongue is raised, the pipes are thrust between the wheel spokes, thus locking the wagon. A strong coil spring may be fastened to the top of the tongue and the underside of the platform, as shown. This will pull the tongue up as soon as it is released, making it impossible to forget to lock the truck.—J. B. Butler, Winchester, Ky.

Machining and Finishing Fiber

Hard fiber is, in general, a hornlike material of great strength and endurance. It is made from a cotton or linen base and is practically pure cellulose that has undergone a molecular change and has been condensed to a fraction of its original volume. It may be worked with the

usual metal-working tools, and turned, milled, drilled or tapped with more speed than metal. Owing to its elasticity, however, it yields somewhat to the tool, causing friction beyond the cutting edge which very quickly heats the tool; therefore very hard tools with good clearance are necessary, diamond-pointed tools being best for turning. Oil may be used to keep the tools cool and does no harm to the fiber. Fiber may be readily sawed with a woodworkers' band saw, but circular saws heat quickly, and must be of special design. Under pressure, the better grades of fiber will flow to a considerable extent, especially when heated to 300° F., and may be embossed and pressed into many shapes.

Owing to the tendency of fiber to shrink and swell with changes in temperature and humidity, one cannot expect extreme accuracy in the size of the finished pieces. For instance, a washer or hole may be accurately turned to 2 in. in diameter and in a day's time it may be .005 or .01 in. over or under the original size. In designing fiber parts, therefore, there must be an allowance, for machine finish, of at least .01 in., and, for sawed or rolled plates, from $\frac{1}{4}$ to $\frac{1}{32}$ in. Before finishing parts in which accuracy is important, the fiber should be dried for several hours at a temperature of less than 200° F., and covered with lacquer immediately after finishing. Fiber also warps under atmospheric changes, and cutting away large sections from one side of a piece has a similar effect. In many cases this warping is serious, and must be considered in designing.

Oils, paraffin, gasoline, and similar products have no effect upon fiber, and cannot be made to penetrate it. Water, however, when in contact with fiber for some time, is absorbed and causes it to swell. Upon drying, the fiber resumes its former density. Different qualities, of course, will differ widely in this respect. When exposed to moist air for 24 hours, fiber increases in weight from one to five per cent. Acids and salts soluble in water will penetrate fiber and frequently injure or destroy the texture. Fiber appears to increase in strength with age. Many attempts have been made to waterproof fiber, but without practical results. A surface coating of varnish or lacquer offers only temporary protection.

Fiber under prolonged dry heat, at 300° F., will lose some of its strength, and will begin to disintegrate at 400° F., to smoke at 500° F., and burst into flame at a temperature 50° higher.



Homemade Greeting Cards

By W. C. HARRIS

IF one wishes to get away from hackneyed printed or engraved greeting cards during the holiday season, it is a comparatively simple matter to make most attractive cards by photography.

The first step, if elaborate cards are to be made, is to build up the "dummy." The negative, or a finished print, is laid on a sheet of drawing paper and a layout of the lettering, etc.,

is made around it. The lettering, monograms, etc., that are to appear on the design may be drawn on separate pieces, and the whole arranged to best advantage around the photo. When the desired arrangement is completed, the loose parts are inked in, stuck down on the bristol board together with the print, and a negative made of the whole layout. This is used to print the greeting



Left: Greeting Card with White Letters, Made by In on Enlargement. Right: Letters Printed in Black by Double Printing. Below: Combining Two Films. Top: Letters Inked A "Dummy," from Which Large-Sized Cards are Made

cards. If the lettering is to appear on the print itself, an enlargement, of reasonable size, is made on a good smooth-finish paper, upon which the lettering is inked, making the sentiment expressed suit the picture used, as shown in the illustrations. From this, a copy negative, the exact size of the desired card, is taken, and contact prints made. These should be mounted on rough cover paper, contrasting in color with the print.

The lettering may be printed in white through some thin part of the original negative, by making a positive of the lettering, on commercial film, and then laying it over the picture negative so that the lettering comes in the proper position. It is necessary to make the posi-

tive film larger than the negative, so that no edge may show in the finished print, and to keep it all clear except for the letters, by masking the negative from which it is printed. The letter positive and picture negative are bound together, and the cards printed through both.

It is best to make the card prints on double-weight, linen-finish buff or white paper, and it is well to make the prints to suit a particular size of envelope, as it is usually easier to do this than to find an envelope to suit the print.

Should any difficulty be encountered in making the prints stay flat, it may be overcome by dampening the backs, and putting them between blotters, under a weight, and allowing them to dry.

Ventilating Doors for Garage

The garage doors shown in the illustration are somewhat unusual in that a lattice gate is hinged to the edge of one



A Lattice Gate, Hinged to One Garage Door and Hooked to the Other, Keeps Undesirables Away When the Owner is Working on the Car

door, and, when the doors are opened, may be hooked to the edge of the other.

This gate is made of wood strips, set in a light frame at an angle of 45°. When the doors are shut, or opened full, the gate is folded back against the door to which it is hinged. This arrangement admits plenty of light and air while working on the car, and at the same time prevents the entrance of unwelcome visitors.

Renewing a Radio Crystal

When the galena crystal of a small radio set has become dull and dirty, so that it is almost impossible to find a sensitive spot, a simple but very effective method can be used to renew it.

The mounted crystal should be held over a flame, in an old spoon, until the

metal begins to run. The crystal can then be turned over with a piece of wire, thus exposing an entirely new sensitive area. A mold can be used to keep the melted metal in the original shape and size, so that it will fit in the detector cup. Care should be taken not to heat the metal too much beyond the melting point, as this will impair the sensitiveness of the crystal.

Improving the Hand Drill Press

The photograph shows a method by which a small hand drill press can be more conveniently operated. With the



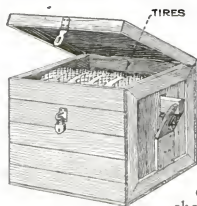
drill press as bought, a clamp is provided for holding the work, as it is necessary to use both hands, one to turn the crank and the other to feed the drill by pressure on the lever. By drilling a hole in the feed lever and attaching a strap, or chain, running from the lever to a pedal on the floor, the necessary pressure of the drill against the work is obtained by pressing on the pedal. This makes it unnecessary to clamp the work, except in special cases, and leaves one hand free to hold it while the other is used to turn the drill.—C. R. Gains, Colfax, Ia.

Keeping Sewing-Machine Belts from Slipping

Sewing-machine belts, especially new ones, occasionally will slip off the upper pulley, even though the belt has been properly tightened. This can easily be overcome by stretching a flat rubber band, about $\frac{1}{8}$ in. wide and $2\frac{1}{2}$ in. long, around the top pulley, and laying it in the groove. After replacing the belt, the slipping will be found to be entirely eliminated, owing to the strong adhesion between the rubber band and the belt.

A Chest for Storing Tires

Every owner of an automobile has felt the need of a safe and convenient place for storing tires not in use, as they are



injured by oil, heat, and light, as well as by standing under weight continuously. Many owners lay their cars up for the winter, and when this is done, the tires should be removed from the wheels, and stored in a chest of the design shown, in which they can be suspended. It should be made large enough to provide ample space for five or six tires. The lumber used in constructing it is tongued-and-grooved stock, to make the box light-tight. A crossbar, longer than the box, slides through slots cut at each end, and can be raised by small pieces of wood, as shown, so that the tires can be lifted to clear the bottom of the box. Small bolts, screwed to the wooden pieces, fit into holes drilled in the crossbar, to hold it steady. A padlock should be provided to protect the tires against theft.—M. V. Tessier, Nyack, New York.

Mousetrap Trips Camera Shutter

In photographing wild birds and animals, it will be found that a mousetrap can be used to advantage for automatically releasing the camera shutter, when the object to be photographed is at the proper focal distance from the lens and directly in line with it.

As shown in the photograph, the

mousetrap is attached to the bellows track by a clip. A strong thread is attached to the shutter trigger and mousetrap, and is adjusted so that it is just tight



A Common Mousetrap Attached to a Camera may be Used to Trip the Shutter Automatically When Photographing Wild Birds and Animals

enough to snap the shutter when the trap is sprung. Another string is attached to the bait pan or hook, and, after being passed around a pin on the trap base, is led to the nest or lure. Only a slight movement of the string is required to spring the trap and release the shutter.

With a shutter speed of $\frac{1}{50}$ second, and the lens open at U. S. 4, the negative will receive ample exposure in the shade.—W. W. Baumeister, Cambridge, Mass.

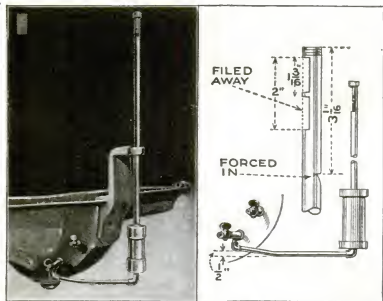
Making Icebox More Efficient

A simple and effective method of saving ice in the household refrigerator is shown in the drawing. A rubber tube is fitted over the drip pipe, and the lower end is placed in a cup set in the drip pan. The cup is always kept full, and there is thus a water seal at all times on the drip pipe, preventing warm air from ascending the latter and melting the ice. Before this device was used, we consumed an average of 175 lb. of ice per week. Since fitting it, this has dropped to 125 lb. per week.—W. S. Wilson, Woodlawn, Pa.



Handy Oil Gauge for Light Car

Keeping the proper amount of oil in the crankcase at all times becomes a very



A Handy Oil Gauge for a Popular Car, Mounted on the Dash, Reminds the Driver of the Amount of Oil in the Crankcase

simple matter when an oil gauge, mounted on the dash in full view of the driver, is used. The gauge shown in the drawing, which can be made at very small cost, has been found to be accurate and substantial, and has given entire satisfaction.

A piece of $\frac{1}{4}$ -in. brass pipe, about 20 in. long, threaded on both ends, is cut and filed as shown. A portion of pipe below the small cut is bent in to hold a glass tube which must fit exactly in the bore. This cut also serves as an air vent to allow the oil in the gauge to rise to the same height as that in the crankcase.

A $1\frac{1}{4}$ -in. nipple, $3\frac{1}{2}$ in. long, which is used as a float chamber, is fitted with two caps, each being bored and tapped in the center, the top one to receive the brass pipe and the lower one a $\frac{1}{8}$ -in. elbow. Then a length of $\frac{1}{8}$ -in. pipe, a tee, and another elbow are used to connect the float chamber to the crankcase at the lower-petcock hole; the cock is removed and screwed into the end of the tee. All joints should be made oil-tight, when the gauge is finally assembled, by applying red lead mixed in linsseed oil, to the threads. The iron pipe must be bent approximately as shown, so that the lower cap of the float chamber is slightly below the petcock and just in front of the right crankcase arm. The brass pipe must be perfectly vertical and close against the dash, to which it is attached with pipe clips. All parts of the gauge should be fastened securely, so as to prevent undue vibration.

A piece of No. 12 aluminum wire, 2 ft. long, is taken, and one end fastened securely into the center of a cork, $1\frac{1}{8}$ in. in diameter. After the cork has been well shellacked and dried, it is placed in the float chamber so that the wire extends vertically in the brass pipe. Oil can then be poured into the crankcase until it rises high enough in the float chamber to just raise the cork. The top of the wire should now be cut off so that $\frac{1}{4}$ in. will show at the bottom of the glass tube. This is to indicate the lowest safe oil level. The end of the wire can be colored with some bright paint. When this colored portion is near the center of the glass, it indicates that the correct amount of oil is in the crankcase, and when it reaches the top of the glass, shows that the oil has reached the level of the upper petcock. The oil level should never be allowed to get below the middle point.—Edmund D. Haigler, Watertown, Mass.

Fence Wire as Concrete Reinforcement

Finding it necessary to provide a safe place for his gasoline and coal-oil tanks, so as not to increase the rate of insurance on adjoining property, a progressive Iowa farmer used woven fence wire for reinforcement in the concrete walls and roof of the structure, and found this to be just as satisfactory as the much more expensive reinforcement that he had used previously in similar work. The strength of the concrete reinforced in this way is shown by the fact that there is not a crack in the roof, although it was made over 15 years ago, and is only 3 in. thick.

A water tank, eight years old, similarly reinforced with a liberal quantity of woven wire and old iron rods, also has proved to be very strong, as not a crack can be seen in it, while other concrete tanks, built later, and not reinforced in this way, are cracked and useless.

The crumbling stone wall of one of the barns was renewed in a similar manner. A trench was dug outside of the old wall, and a form, made of boards, was built, as high as the wall and 3 in. from it. After having inserted three thicknesses of woven wire, on edge, into the form, it was filled with thin concrete. The top of the concrete was then beveled away so as to carry off the rain.—Ed. Henderson, Lake Mills, Ia.

materials from: Bell & Howell
1803 Marchmont Ave. Chicago



Williams, Browne & Cable
918 Chestnut, Philadelphia, Pa.

A HOMEMADE MOTION-PICTURE

CAMERA

Best Camera Co.

By R.E. Best

109 N. Dearborn

Chicago

THE making of a moving-picture camera and projecting apparatus that will do work quite favorably comparable with that of high-priced machines, is not so difficult an undertaking as might at first appear, nor does it involve great expense. By the use of ordinary tools, the expenditure of a little time, and by careful work, a very satisfactory piece of apparatus may be produced.

The camera here described uses standard motion-picture film, and will contain 100 ft. at one loading. The magazine can be removed and the camera itself used to project the pictures, which will be found to be practically as satisfactory as the use of a separate projector. The dimensions are taken from a camera made by the author;

a slight variation may in some cases be necessary, depending on the material used, and the focal length of the lens.

Standard motion-picture film is $1\frac{1}{8}$ in. wide, and perforated on both edges. The pictures are 1 by $\frac{3}{4}$ in., and there are 16 pictures to the foot. The film must be moved past the lens with an intermittent motion at the rate of a foot a second. A rotary shutter is provided to cut off the light when the film is moving, in order to avoid blurring the pictures. There are several ways in which this intermittent motion may be produced, but

the one described will be found the most practical for amateur construction.

The lens can be borrowed from an ordinary camera. Since the pictures are of such small size, the lens must be of short focal length, preferably from 2 $\frac{1}{2}$ to 4 in. A combination of two lenses of 6 or 7-in. focal length will give the desired result. The box is best made of

maple about $\frac{3}{4}$ in. thick, although any thin close-grained boards will do. The joints should be mortised, as shown in the illustrations, to prevent any possibility of light leakage. The gears can be obtained for a modest sum from any house selling standard gears. The sprockets can be made by one who has access to a lathe, but it is



The Finished Camera Set Up and in Operation: Note the Heavy Tripod, Which Is Necessary to Insure Steady, Even Pictures

better to buy them from a motion-picture supply house. The other materials can be obtained from any hardware dealer.

The following materials will be needed:

- 1 6-in. gear, 32-pitch.
- 2 3-in. gears, 32-pitch.
- 1 $\frac{3}{4}$ -in. gear, 32-pitch.
- 1 pair bevel gears, $\frac{1}{2}$ by 2 in.; that is, ratio 1 to 4.
- 2 standard motion-picture sprockets, 16-tooth, with idlers.
- 1 $\frac{1}{4}$ -in. gear, 48-pitch.
- 1 rack, 6 in. long, $\frac{1}{8}$ in. square, 48-pitch.
- 1 bushing, $\frac{3}{16}$ -in. inner, and $\frac{3}{8}$ -in. outer diameter.
- 3 lb. babbit.
- Brass rod, $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{3}{16}$ in., and $\frac{1}{8}$ in. in diameter.

Albough - 2500 E. Lake Chicago
942 N. Lake Chicago

Albough - 2500 E. Lake Chicago
942 N. Lake Chicago

W. H. H. Canal Chicago

First make the box, 12 by 7 in. inside dimensions, the front portion containing the mechanism to be $7\frac{3}{4}$ in. deep and the rear portion, or magazine, 5 in. deep. One side of the front portion should extend 2 in. above the top of the box to form one side of the finder. A groove, $\frac{1}{8}$ in. deep and $\frac{1}{2}$ in. wide, should be cut in the top and bottom of the front, $2\frac{1}{4}$ in. from the right side, looking from the back, before the box is assembled, to allow the plate that holds the gears, sprockets, etc., to slip in and out. A rectangular hole, $3\frac{1}{2}$ by $4\frac{1}{8}$ in., is cut in the front to allow the focusing device to be set in, and an opening for the inspection door in the left side. All joints should be glued and made light-tight. The rear portion should have a $\frac{3}{4}$ -in. strip set around the inside to project about $\frac{1}{4}$ in., so that when the two parts of the box are brought together, this strip will come inside the front and back portions, and make the joint light-tight. It would be well to face the edge of the box with felt.

Set the lens in the front of a box, constructed of $\frac{1}{4}$ -in. material, 3 by $3\frac{5}{8}$ in. by $1\frac{1}{2}$ in. in outside dimensions. The bottom edge of this box should extend about $\frac{1}{8}$ in. beyond the sides. A piece of the 48-pitch rack, $\frac{1}{8}$ in. square and $1\frac{1}{2}$ in. long, should be set flush in the center of the bottom. This box should slide quite easily in a $3\frac{1}{2}$ by $3\frac{1}{2}$ by $4\frac{1}{8}$ -in. box which is set in the front of the camera. The base of this outside box is bored in the center to take the pinion, and a hole drilled at right angles to this for the pinion shaft; grooves are also cut in the sides to fit the projecting bottom of the box holding the lens. The box should have a block, $2\frac{3}{4}$ by $2\frac{1}{4}$ by $1\frac{1}{4}$ in., bored with a hole somewhat larger than the outside diameter of the lens, fastened to the inside of the back. This block should be fitted so that the box containing the lens will not bind in sliding back and forth. The back of the outside box should have a hole cut in it, of sufficient size to let the light from the lens fall on the film in the film gate, yet small enough to keep the light from spreading over other parts of the camera.

The pinion can be made by soldering a $\frac{1}{4}$ -in., 48-pitch gear to one end of a short piece of $\frac{1}{8}$ -in. brass rod. If a knurled brass button for the other end cannot be obtained, a button can easily be cast from babbitt.

This arrangement will be found to permit the lens to move quite freely in focusing and will admit no light to the camera except through the lens. When the cam-

era is complete, the proper position of the lens for objects at various distances can be determined by trial, and the positions marked.

The gears, sprockets, film gate, striker, shutter, etc., are all supported by one piece or plate which can be removed from the box as a unit. Make this plate of $\frac{1}{2}$ -in. hardwood, $12\frac{1}{4}$ by 6 in. Fit it to slide in the grooves in the camera box, where it can be fastened in place with screws when the mechanism is finished. Another plate of the same material, $11\frac{3}{4}$ by 6 in., should be fastened to the first by means of blocks, separating the two plates $1\frac{1}{8}$ in. The blocks must be located carefully, to avoid interference with the gears, and held in place by screws. Mark out the location of the four shafts, and bore holes in both plates, $\frac{1}{2}$ in. or larger in diameter. Make bearings of babbitt or heavy brass, bored to the size of the shaft and shaped so they can be fastened to the wooden plates by means of screws. These bearings can be moved until the gears mesh properly before they are permanently fastened in place.

The shaft to which the crank is attached should be of $\frac{5}{16}$ -in. brass rod. This shaft carries the 6-in. gear and the 2-in. bevel gear, and extends outside the camera to take the crank.

The crank should be turned at the rate of two turns a second, and, as the sprockets have 16 teeth, representing 3 in. of film, or four pictures to the turn, the sprocket shafts should turn twice as fast as the crankshaft in order to feed the film at the rate of 16 pictures a second. These two shafts are $\frac{1}{4}$ -in. brass rod and carry 3-in. gears. The lower shaft should have a 2-in. pulley placed between the sprocket and the bearing plate to drive a round belt running to the take-up reel. This pulley can be easily made of two circular pieces of cigar-box wood, glued together and grooved.

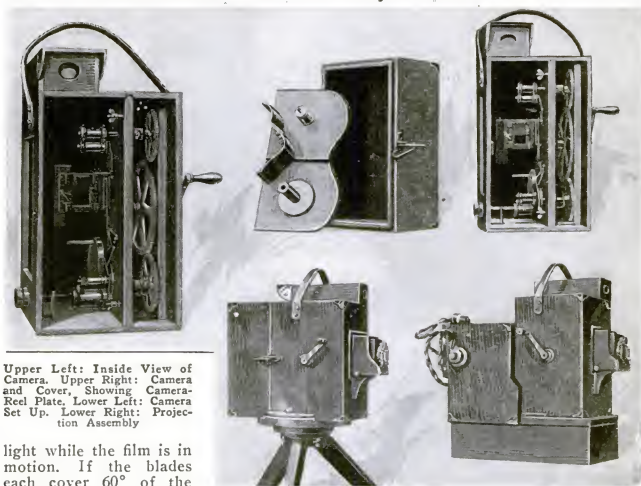
A $\frac{3}{16}$ -in. hole should be bored in the edge of the bearing plate for the shutter shaft, and the plate must be cut away in the center to allow the $\frac{1}{2}$ -in. bevel gear attached to this shaft to mesh with the 2-in. bevel gear on the crankshaft. The hubs of all the gears should be fitted with setscrews, and it is well to file flats on the shafts under these screws to prevent slipping.

The idlers should be attached to strips of heavy sheet brass and placed against the sprockets in the position shown. The strips should be pivoted at one end on a screw, and held in place with small coil springs.

The shutter should be cut from a 4-in. disk of sheet brass, bored with a $\frac{1}{8}$ -in. hole in the center and soldered to the end of the shaft, which should be shouldered to fit the hole. It must be designed in such a manner that it will shut off the

small pieces to the back. It is quite important that the wheel be balanced to prevent vibration, which produces unsteady pictures.

The film must be held stationary and perfectly flat when the exposure is made.



Upper Left: Inside View of Camera. Upper Right: Camera and Cover, Showing Camera-Reel Plate. Lower Left: Camera Set Up. Lower Right: Projection Assembly

light while the film is in motion. If the blades each cover 60° of the circle they will be found to be sufficiently large. The shutter has two blades and consequently should turn four times as fast as the crankshaft.

The striker serves not only to pull the film down through the film gate as it is taken up by the lower sprocket, but acts also as a flywheel. For this reason it should be heavy and well-balanced. It should be $2\frac{3}{4}$ in. in diameter by $\frac{3}{8}$ in. thick, and may be cast from babbitt in a wooden mold (do not use pine or any wood containing pitch for molds). The arm that comes in contact with the film may be made of sheet brass, and soldered to the edge of the wheel. It should be filed away slightly in the middle for a distance of 1 in. so that it will only come in contact with the edges of the film and not scratch the pictures. After the striker has been bored and fitted to the end of its $\frac{3}{8}$ -in. shaft, it should be trued up on a lathe if one is available, and carefully balanced by boring holes or soldering

It must also be allowed to move quite easily when pulled down by the striker. This is done by means of the film-gate assembly, which consists of three parts: the film gate, cast in babbitt, the pressure plate, and the cover, made of heavy sheet brass. The film gate is fastened rigidly to the main bearing plate by means of screws; the pressure plate holds the film against it and is allowed to give slightly as the film moves through. One edge of the cover fits into a groove or notch in the film gate, and the other edge is held down by means of a thumbscrew.

It requires a little ingenuity to build the mold to cast the film gate, but by combining blocks of wood of the proper size and shape, a mold can be built up which will make a very nice casting. When the casting is finished, smooth it up with a file and cut a groove in the base with a hacksaw for the edge of the cover. The surface around the "frame"

and along the edges of the passageway for the film must be carefully smoothed, as these parts come in contact with the film, which is very easily scratched. The rectangular hole, or frame, should be 1 in. by a little less than $\frac{3}{4}$ in., to avoid any overlapping of pictures.

The pressure plate should fit quite loosely in the film passageway in the film gate. Its upper edge is curved to avoid scratching the film, and it is fitted with four short posts of $\frac{1}{8}$ -in. brass rod, which reach through the cover and come in contact with flat springs. These springs keep the pressure plate tightly against the film, yet allow it to give when uneven parts of the film, such as splices, come through. The frame for the picture is cut through both the cover and pressure plate as well as the film gate, to allow the light to go through in projecting the pictures. The side of the pressure plate which comes in contact with the film should be highly polished to avoid any possibility of scratching the film.

The cover consists of a piece of sheet brass to which are attached the springs that hold the pressure plate against the film. These springs are pieces of watch spring, supported in the center and inclosed at each end. The center supports can be cut from sheet brass and soldered in place. The little boxes inclosing the ends of the springs can also be made of sheet brass, and soldered to the cover. This arrangement will be found to hold the springs in their proper place without the necessity of boring the hard steel. The springs must be bent until they put the proper pressure on the film; this will have to be determined by experiment.

Build a box, 2 by $2\frac{1}{2}$ by 8 in. inside dimensions, on top of the main camera box, to inclose the finder. Fasten a small double-convex lens of 5 or 6-in. focal length in the front of this finder, and leave a hole, about 1 in. in diameter, behind the lens to admit light. A lens suitable for this purpose can be obtained from any optician or may be taken from an old bicycle lamp or flashlight. The screen for the finder can be made by removing the emulsion from a piece of film and roughening it with fine sandpaper. It should be placed in the finder at the focal distance of the lens. When the camera is all complete and assembled, a black border should be painted on the screen to allow only those parts of the image to show that are thrown on the film in the frame by the main lens. The back of the finder should be inclosed to shut out the light, and a peephole, about

1 in. across, should be cut in it. A brass hood will add to the appearance and allow the finder to be closed when not in use.

The camera is now ready to assemble. Fasten the film gate to the bearing plate in such a position that the frame will come directly behind the lens, and at such a distance that the range of the focusing device will permit objects at any distance to be focused on the film. Put in all the shafts, gears, sprockets, etc., attach the crank, and adjust the bearings until all the gears mesh properly and run smoothly.

Now remove the crank and crankshaft, insert the bearing plate in the camera box, and fasten it in place by screws at top and bottom. Locate the position of the crankshaft on the side of the camera, and bore a hole somewhat larger than the shaft. Cast a circular piece of babbitt, 1 in. in diameter and $\frac{3}{16}$ in. thick, and bore a $\frac{3}{16}$ -in. hole in the center. This is placed on the outside of the box, the shaft inserted, and the gears set in place. The circular piece of babbitt can then be fastened to the outside of the camera by means of screws, to act as a bearing and prevent the leakage of light around the shaft. The shutter should be properly timed when the bevel gears are meshed.

A 6 by 11 by $\frac{3}{16}$ -in. plate should be fastened to the back of the main bearing plate for the purpose of holding the supply and take-up reels. Thumbscrews should be used for this purpose, as the plate must be easily removable when the camera is used for projection purposes. The pulley on the take-up reel must, of course, line up with that on the shaft in the camera, and a small belt be fitted.

The fastenings that hold the cover should be designed to pull the two parts of the camera tightly together. Fasteners can be made of heavy wire and small pieces of strap iron, as shown in the illustration. The tripod must be of heavy construction and quite rigid, as a wobbly tripod will produce jerky, unsteady pictures.

By removing the plate holding the supply and take-up reels, the camera can be used for the projection of the finished film, and if the work has been carefully done, the resulting picture will be as clear and steady as those made by professional apparatus. The best light for home use is a 250-watt stereopticon lamp, set behind a pair of condenser lenses. These can be taken from a stereopticon, or purchased at the optician's. The box must be well ventilated, and should be

lined with asbestos, as it gets very hot if used for any length of time. A supply reel and a take-up reel must be arranged, and the latter can be run by a belt from the pulley in the camera.

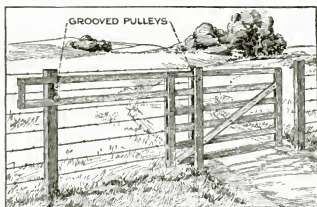
If one expects to develop and finish the film in his own dark room, some sort of apparatus must be constructed to handle the wet film. In handling small quantities, of 50 ft. or less, the most economical way is to construct a cylindrical reel 15 to 24 in. in diameter and about 2 ft. long. Let this rest in a frame so that, as it turns, it dips into a pan containing

the chemical. The film can be wound on the reel, emulsion side out, and passed through the successive baths of water, developer, and hypo, and then dried without being disturbed.

When the negative film is developed and dried, it must be printed on positive film before being projected. It can be printed in the camera by running the positive and negative films through together past a light, but it will be found more economical to send the negative to a laboratory, where the printing will be satisfactorily done for a few cents a foot.

A Practical Sliding Gate

The sliding gate shown in the drawing has decided advantages over many styles



A Type of Sliding Gate Which Is Neat in Appearance and Easy to Handle, as There Is Very Little Friction in the Parts

of similar gates now in use. It is neat in appearance and easy to open and close, as there is very little friction.

If a clear 10-ft. opening is desired, the posts on each side of the driveway should be about 11 ft. apart. One gatepost is made double to prevent the gate from being dislodged, and has a pulley in the center, to carry the top bar of the gate. Both upper bars are 22 ft. long and extend to another post, placed 11 ft. from the double one, where they are held in place by two grooved pulleys, as shown. A crosspiece must also be provided on the gate to prevent it from sagging.

An Improvised Developing Tray

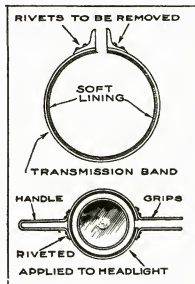
A photographer, having broken one of his glass developing trays, and being unable to obtain another immediately, made a tray of paraffin to serve as a temporary substitute.

After melting about a pound of paraffin, it was poured into a large pan of hot

water, until the layer of paraffin floating on the surface was about $\frac{1}{4}$ in. thick. When the paraffin had cooled down until it was fairly hard but still pliable, it was removed and pressed into a glass developing tray, the inside of which had been moistened with water to prevent the paraffin from adhering to it. The surface of the layer of paraffin was smoothed, and the edge cut even with the glass edge. After hardening, the paraffin was removed and found to form a serviceable tray that could be cleaned very easily and was not affected by the chemicals.

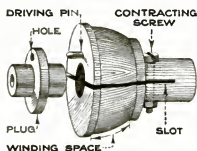
Tool for Removing Headlamp Rims

The removal of the bayonet-lock type of headlamp rim is one of the stubborn jobs that tries the patience and skill of practically every auto repairman or service man. The drawing shows a tool by means of which the rim is gripped with a uniform pressure at all points, and it is only necessary to grip and turn the handles to loosen even a tightly "frozen" rim, without damage. The tool is made from the transmission band of a light automobile, and fitted with a new, soft, white lining. The ears of the band are knocked off and their place taken by a pair of flat-iron grips, and on the opposite side of the band a handle is riveted.



Variometer-Winding Form

Amateurs who wish to build their own radio instruments will find the stator-coil winding form illustrated a great convenience. The larger piece is the form proper; it is made of hardwood, the radius of the section on which the wire is wound being the same as the radius of the winding seat in the stator half, less twice the over-all thickness of the wire used. A cylindrical section, a few inches long, is turned on the smaller side of the form, and the face on the larger side is recessed to take the plug shown. This plug may be of hardwood or metal, as preferred; it is drilled to fit a driving pin driven into the form, and is



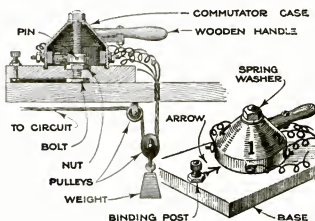
centered, as is the opposite end of the form, to permit winding between lathe or other centers. The form is slotted, as shown, for a portion of its length, and fitted with a screw and nut. When the form has been wound, and the stator half coated with adhesive, the form is dropped into place and weighted or clamped until the cement is dry. Then the contracting screw is tightened, and the form can be removed very easily.—H. F. Lowe, Washington, District of Columbia.

Four-Way Switch Made from Old Automobile Timer

For low-voltage circuits, where there are not more than four different lines over which the current is to be distributed, an old timer from a light automobile can easily be converted into a four-way switch.

Make a base of some insulating material, about 8 in. square and 1 in. thick, and drill a hole through the center as large as the end of the shaft over which the timer roller fits. Counterbore this hole large enough to take a bolt head, and cut a similar depression in the top of the base; both should be concentric with the hole. Get a bolt over which the timer roller will just slip, and $\frac{1}{2}$ in. longer than the distance between the bottom of the base and the top of the timer shell when the latter is set on the base. Cut the threads the entire length of the bolt, file the head down to a thickness of about

$\frac{1}{4}$ in., and drill a small hole $1\frac{1}{2}$ in. from the head. Push this bolt through the



Four Electrical Circuits Controlled from One Switch: The Switch is Made from a Timer Taken from a Light Automobile

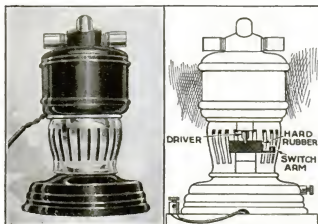
hole from the bottom of the base, and run on a locknut to hold it securely in position. Then put on the roller, and pin it to the bolt through the small hole. Be sure the roller points exactly toward one side of the base, and then lock the bolt in that position. Connect the bolt head to a large binding post in the base, just forward of the roller; this is the ground-wire post. Paint an arrow pointing from this post toward the center. Drill a hole, to fit the bolt, through the shell, place it in position, and run a pencil around it to mark its outline on the base. Scribe a second circle inside the first, $\frac{1}{8}$ in. away from it. A circular groove, $\frac{1}{8}$ in. deep, is cut out to serve as a track for the edge of the shell. Cut a wooden handle to fit over the timer-rod arm, and bolt it in position. Paint numerals on the shell in the order shown, opposite the terminals. Finally, slip the shell over the bolt, put on a spring washer, and run on the nut, turning the latter down just enough to hold the shell in the track and allow it to be turned around easily with the handle. Fasten the base to the table, or bench, and drill a hole in it, one on each side of the base.

Connect flexible cords to the timer terminals, allowing plenty of slack, and run them through the holes, where they are looped over the weighted pulley shown. Each cord is then fastened to the underside of the bench. Set a knife switch in the ground line beyond the base.

To operate, open the ground switch, swing the number of the circuit desired around toward the arrow, throw in the switch again, and only that circuit will be in operation.—L. B. Robbins, Harwich, Massachusetts.

A Neat Radio Interrupter

The radio interrupter illustrated is made from common materials and pre-



An Electrically Operated Interrupter for the Amateur Radio-Transmitting Set That is Made from an Electric Motor, the Metal Guard of an Old Casserole, and Miscellaneous Electrical Parts

sents a very attractive appearance when finished.

The base, made from a wood or hard-rubber fixture base, has mounted in its exact center a discarded switch arm, knob, and bearing, from which a wire connection runs to a binding post at the edge of the base. Soldered to the end of the switch arm, which clears the slotted metal guard by $\frac{1}{8}$ in., is a small piece of spring brass, about $\frac{1}{4}$ in. thick by $\frac{1}{4}$ in. wide. This is so arranged as to make and break contact with the small silverplated casserole guard, which is mounted between the motor and base, and to which a binding post is soldered for the second connection. The shaft of the small fan motor used is connected at the lower end to the knob of the rotating switch arm by means of a tube, forced over the shaft and flattened at the end. This end fits into a slot in the hard-rubber switch knob, so that there is no direct electrical connection between the switch and motor.

In case a device such as this is to be used on a high-voltage lighting or other circuit, it will be best to insulate the motor from the slotted casserole cover. This can be done by placing heavy-paper washers and bushings on the motor bolts. —R. U. Clark III, Newton, Mass.

Keeping Water Out of Automobile Casings

Automobile owners are frequently troubled by water in the tire casings, admitted through the opening for the valve stem. This water and the rust that results, cause much wear on the inner tube.

An excellent method of preventing this trouble is to cut several washers, about 2 in. in diameter, from an old inner tube. A small hole is cut in the center of each, so that it can just be forced over the valve stem, making a tight fit. When the rim is put in place on the wheel, the washers will be compressed in the space between the felly and rim, making it impossible for the water to enter.

An Improvised Dark Room

For changing plates, loading holders, and even developing negatives, when there is no dark room at hand, an ordinary coat and a wash boiler, box, or similar light-tight vessel, can be made to answer. The

coat is buttoned up and the skirts are securely tied around the top of the wash boiler, in the case shown in the photo, or the box, after the plates and holders and a small light-tight box have been put in. The operator runs his arms down through the sleeves of the coat and changes the plate or removes exposed films from the film pack, placing them in the box. In the case of film packs, single films can be developed by placing them in a tumbler of developer that is mixed as for a tank; other tumblers are provided for clear water and for the fixing bath. —Hallie H. Holt, Salem, Ill.



Feed Box That will Not Overrun

It is frequently desired to have a feed or salt box in a feed lot or pasture. Some animals seem to delight in upsetting the usual type of box, but one made according to the drawing, with the sides extending beyond the corners, will be proof against the mischievous antics of the stock. The pieces for the box



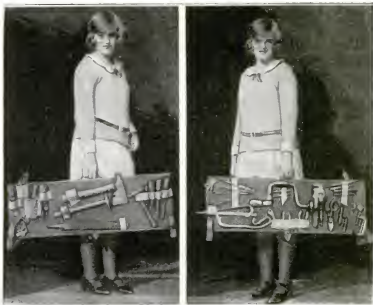
are cut just twice the length required for the actual dimensions of the box.

A Convenient Tool Rack

The rack for holding tools shown in the photo has all the advantages of a tool box, none of its drawbacks, and several advantages of its own.

A piece of scrap lumber is used for the rack; it is fitted with two feet, one at each end, made of strap iron, and with a handle, taken from a screen door, at the top. The tools are held on the board by means of canvas straps, nails, and wire hooks.

All tools are instantly accessible, and the rack can be picked up and carried to any part of the house, so that there is no running back for the tool that is always forgotten. Room for more tools can usually be made.



A Rack That Keeps the Household Tools Always at Hand: The Tools Are Instantly Accessible, and the Rack can be Carried Anywhere, as It Is Provided with a Handle

Screwing Down Grease Cups

Most automobiles have several grease cups located under the floorboards, and these must be screwed down occasionally. This operation is often neglected, because the floorboards must be lifted in order to get at the cups.

To overcome this difficulty, a small hole should be drilled and tapped in the center of each grease-cup cap. A machine screw is screwed into this hole and riveted securely on the inside. If holes, large enough to admit the end of a screwdriver, are then bored through the floorboards, the screwing down of the caps becomes the work of a few minutes.

Standards for Displaying Small Flags

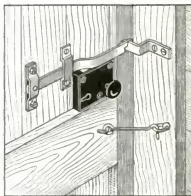
When decorating the exterior of a house with small flags it is not usually desired to nail the staffs to the building because the nails split the sticks. The trouble can be overcome by using standards of the type illustrated, which are made from wooden doorstops. Remove the rubber tip and drill a hole to a depth of at least 2 in. and just large enough to fit the flagstaff. A setscrew, made from a screw-eye, prevents the staff from becoming loose and falling out. Several such standards can be arranged on a board if it is desired to prevent marring walls or exterior finish.



Convenient Garage-Door Lock

It is hard to improve on two stout wire hooks for fastening a sliding door on a garage after the car has been run in, but when the car has been taken out, and the driver wishes to get away in a hurry, the hooks are inconvenient, as he must go inside again in order to fasten them. A

quickly operated fastener, secure enough for use in a single garage when the car is out, can be made from a common door lock and a few pieces of flat iron. A



latch is made from the flat iron, as shown in the drawing, and the lock is screwed to the door so that the bolt comes directly under the latch. When the bolt is raised with the key, the latch is lifted and the door may be shut. Turning the key then withdraws the bolt, and the latch drops down over a strap screwed to the lintel. A notch is cut in the end of the latch to fit over this strap, preventing the door from being opened without the key.

⚠ A 1/2-in. hole, cut in the middle of one edge of a towel and sewed like a button-hole, makes it possible to hang the towel so that it cannot fall.

Utilizing Small Car as Bed

Frequently finding occasion to use his car for sleeping quarters, and soon discovering that it did not afford enough



The Back of the Front Seat is Cut at Sides and Bottom So That It can be Lowered When the Occupants Desire to Use the Car for Sleeping

space for this purpose, an open-air enthusiast made the changes in the front seat shown in the photograph.

The back of the front seat was cut out, the edges being turned in and the cushions upholstered in such a manner that the finished job presented a neat appearance. Large door hinges with removable pins were fastened to the sides and bottom, so that the back could be dropped down from its normal to a horizontal position, resting on the edge of the rear-cushion frame. The side hinges lock the back when raised. By doing this, it was possible to utilize the entire car space for sleeping quarters. Mosquito netting, hung all around the car, was provided as a protection.—A. C. Brundage, La Crosse, Wisconsin.

Stenciling Colored Designs on Fabrics

The art of stenciling colored designs on fabrics offers limitless possibilities for the decoration of curtains, table covers, and other articles, or even the decoration of feminine wearing apparel. The stencils can easily be cut, after a little practice, from original designs, or from pictures, or they can be purchased at small cost.

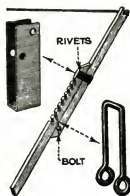
Common tube oil colors are used, and they are applied by means of a stiff, round brush, rather stubby, but not too large. Before mixing the paint, it is squeezed out on a piece of blotter, to absorb the free oil and prevent the cloth from looking greasy. Gasoline is used to thin the paint, which should be made as thin as possible without running on the work. Experiments can be made on a small piece of the goods first, in order to get the paint of the proper consistency. This is the most particular part of the whole process, as, should the paint be too thin, it will creep on the fabric, and, if too thick, will not flow easily, nor color evenly.

The stencil itself must be coated with linseed oil and allowed to dry thoroughly before using. The material to be stenciled is stretched taut on a table or board with thumbtacks, and the stencil is then placed in position and fastened in the same way. The brush, or brushes, if different colors are used, is then used to scrub the material lightly until colored sufficiently. On very thin material, the brush should be tapped on the cloth until the color is spread evenly.

Stencils must be cleaned carefully on both sides after each application, as subsequent work might be blurred or daubed if they are permitted to become dirty. Cheesecloth, cotton scrim, or soft, loosely woven muslin, are good materials to use for stenciling. They may be dyed any desired shade and then stenciled. The result is durable, artistic, and inexpensive. Washable goods can be laundered without injury to the stenciling.

A Collapsible Clothes Prop

A clothes prop that can be folded and stored away in the laundry or outbuilding is an improvement over the usual clothes-line support, because it can be lengthened or shortened to meet varying requirements. Such a prop is made in two parts, one of which is provided with a series of notches into which a link pivoted on the other member fits. A metal strap, in addition to the link, holds the parts together, and serves as a stop to prevent them from being separated.—Harold Jackson, Kanakee, Ill.





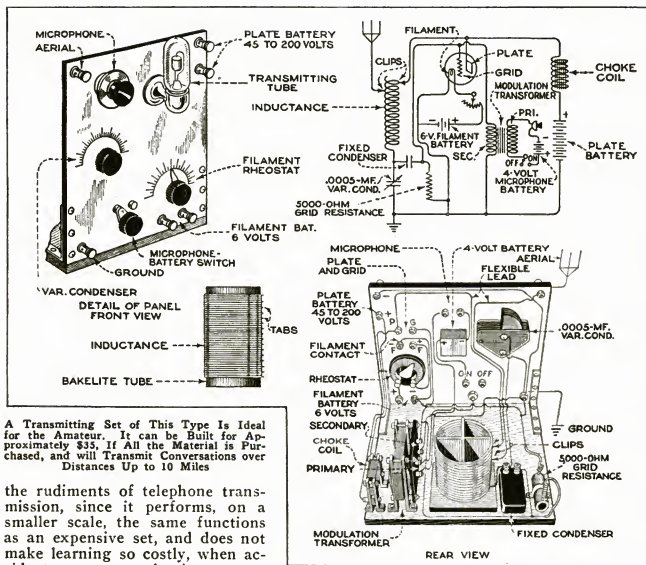
A SIMPLE BATTERY RADIOPHONE

By F. L. BRITTIN

AN experimental radiophone transmitter, operated on dry cells and a storage battery, can be built for approximately \$35, if all the parts are purchased; this does not include the cost of the batteries, and can be reduced somewhat by using homemade parts. With an instrument of this type, conversation can be carried on over distances up to 10 miles. This is the type of radiophone the amateur should build while learning

parts of this set, such as the inductance, the fixed and variable condensers, the transmitting tube, choke coil, modulation transformer, microphone, and the resistances.

The panel, which is made of $\frac{1}{4}$ -in. bakelite, is 10 by 12 in. in size, and is attached to the $\frac{3}{4}$ by 8 by 10-in. wooden base by means of angle brackets. The binding posts for the batteries, aerial, and ground are arranged on the front of



A Transmitting Set of This Type Is Ideal for the Amateur. It can be Built for Approximately \$35. If All the Material Is Purchased, and Will Transmit Conversations over Distances Up to 10 Miles

the rudiments of telephone transmission, since it performs, on a smaller scale, the same functions as an expensive set, and does not make learning so costly, when accidents occur to the instrument.

Before attempting to construct this set, the reader should study the wiring diagram carefully, and should, at least in a general way, understand the principles involved in radiophone work, besides knowing the functions of the various

the bakelite panel, as shown in the drawing. The inductance is wound on a threaded bakelite tube, $4\frac{1}{2}$ in. in diameter and 7 in. long. If not already threaded when purchased, the tube should be put on the lathe and threaded, so that it will take

80 turns of stranded "litzendraht" wire, or the same amount of No. 16 bare copper wire, if the former is not available. At every five turns, a small tab of sheet copper is soldered to the wire, so that the clips of the aerial and plate can be snapped on at different points, to vary the inductance.

The lower end of the inductance coil is connected to one terminal of the variable condenser and also to the fixed condenser. The other terminal of the variable condenser is connected to the ground post. The second terminal of the fixed condenser is connected to three points: to the grid, to one terminal of the secondary coil of the modulation transformer, and to the grid resistance. The remaining terminals of the secondary coil of the transformer and the grid resistance are connected to the ground.

The six-volt storage battery is connected to the filament, care being taken to connect the negative terminal directly to the filament binding post, and the positive terminal to the filament rheostat. The negative terminal must also be connected to the ground.

The B-battery consists of at least four 22½-volt units, such as used for receiving sets. Several units can be used, as the greater the voltage supplied to the plate, the greater the distance spanned by the message. For this reason the plates on transmitting tubes are designed to stand high voltages, as high as 500 volts for the 5-watt size used in this set. The units are connected in series, the negative terminal being connected to the

ground line, while the positive lead passes through the choke coil to the plate, and also to the inductance coil, to which it is attached by means of a helix clip.

The simple matter of connecting the microphone circuit remains. This is done by placing a 4-volt battery, consisting of 3 dry cells, an on-and-off switch, the microphone, and the primary coil of the transformer in series on a separate circuit, as shown.

The variable condenser used is of .0005-mf. capacity, panel-mounting type, and should be able to stand a high voltage. A stop should be used to prevent it from shorting at 90°, as some condensers on the market are designed to do.

The fixed condenser is also of .0005-mf. capacity, especially designed for high voltage. The type used consists of several strips of copper foil between mica, the whole being bolted between two metal plates.

The 5,000-ohm grid resistance is of standard vitrified type. The filament rheostat is of 7 ohms' resistance. The choke coil is of the 150-milliamper type. If the builder desires, he may use an anti-capacity switch in the B-battery circuit, to permit throwing the battery current from the transmitting to the receiving set. The latter, of course, is a separate instrument.

It should also be kept in mind while wiring, that, although the wires are shown running parallel in the diagrams, for the sake of simplicity, they should be kept at right angles to each other as much as possible, in order to reduce induction.

LIST OF MATERIALS

- | | |
|--|---|
| 1 ¼ by 10 by 12-in. bakelite panel. | 1 5-watt transmitting tube. |
| 1 ¾ by 8 by 10-in. wood base. | 1 4½ by 7-in. bakelite tube. |
| 2 6 by 6-in. angle brackets. | 1 5,000-ohm vitrified resistance unit. |
| 6 binding posts. | 1 modulation transformer. |
| 1 filament rheostat. | 1 6-volt storage battery. |
| 4 contact points. | 3 dry cells. |
| 2 switch levers, with knobs. | 4 22½-volt B-batteries. |
| 1 .0005-mf. variable condenser. | 1 150-milliamper standard choke coil. |
| 1 .0005-mf. fixed condenser, C. W.-type, for high voltage. | 3 helix clips. |
| 1 microphone. | Litzendraht wire for inductance, or No. 16 copper wire. |
| | 1 tube socket, for panel mounting. |

Useful Hints for the Motorist

A blow-out patch in an automobile casing will last much longer if a piece of old inner tube is cut and laid between the patch and the inside of the casing. This will prevent the ragged edge of the hole in the casing from wearing through the patch.

The solderless connections that hold

the flexible copper tubing to the gasoline tank and carburetor, often have a tendency to work loose, owing to the constant vibration. By substituting a piece of graphited asbestos-cord packing, such as is used to pack water-pump glands, for the slip ring, it will be found that the joint will not leak, nor will it work loose as quickly as before.—Wm. Byers, Kansas City, Mo.

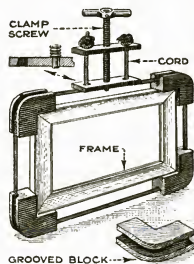
Simple Method of Making Candles

Very serviceable candles, that produce a flame four or five times as large as that of an ordinary wick candle, can be made in the following manner: About 1 lb. of paraffin—such as is used for canning purposes—is melted in a flat pan. A long sheet of tissue paper, about 6 in. wide, is grasped at each end, and is slowly passed through the melted wax several times, each layer being allowed to cool before the paper is passed through again. When the thickness of the wax is about $\frac{1}{8}$ in., the sheet is allowed to cool, and is then cut into pieces from 6 to 12 in. long, depending upon the size of candle desired, and rolled into cylinders.

When dipping, the wax should not be too hot, as it would then melt the layers previously applied, instead of adding a new one. It is best to melt the wax over water, at a temperature of about 212° F. To expose the paper wick for lighting, revolve the end of the candle in a flame until some of the paper lights; it is then ready for use.

A Simple Picture-Frame Clamp

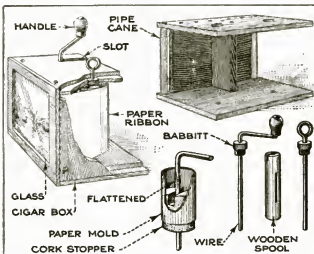
The illustration shows a device that has proved to be very satisfactory for clamping glued picture frames.



Four pieces of hardwood, 3 by $\frac{1}{4}$ in., are cut and grooved as shown. Two pieces of soft steel, or iron, about 5 in. long and 1 in. wide, are drilled at each end. A bolt, about 8 in. long, threaded full length, passes through the center of one plate, which is drilled and tapped to fit it. The bolt is then turned down at the end and seated in a hole drilled through the other plate. A rope is passed around the grooves and through the holes and knotted securely, and the apparatus is assembled as shown. The turning of the bolt will tighten the rope and bring equal pressure upon all four corners of the picture frame. If the clamp screw and the rope are long enough, various sizes of frames can be clamped in the device.

"Moving-Picture" Toy for Children

A very interesting "moving-picture" toy for the small child can be made of cigar



A "Moving-Picture" Toy for the Small Child, That Is Instructive as Well as Amusing, and That can be Very Easily Made from Scrap Materials

boxes, some wire, babbitt or lead, and a few pieces of pipe cane.

A rectangular opening is cut in the bottom of a cigar box, of the size made to contain 100 cigars, and a piece of window glass, cut to fit, is placed behind the opening and held in place by tacks. A frame, shown at the upper right, made of cigar-box wood, fits neatly into the box; this holds the picture ribbon against the glass and carries the spools on which the ribbon is wound. A piece of pipe cane is mounted at each corner of the frame, to serve as a roller.

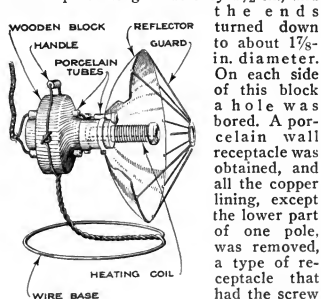
The spindles, one of which has a crank formed on one end, are made of No. 9 galvanized wire, and are provided with babbitt or lead "keys" to turn the wooden spools on which the ribbon is wound. To make these keys, a portion of the wire should be flattened, as shown. A cork stopper is then taken, and, after a groove is cut in the top and a hole drilled through the center, it is pushed on the wire directly underneath the flattened portion. By wrapping heavy paper around this cork, a cup is formed, into which the babbitt can be poured. The wooden spools upon which the ribbon is wound can be made from old film spools, cut at one end to fit the babbitt key.

Children can be amused for hours with this little toy, which can be made instructive as well as amusing. Pictures cut from the comic or rotogravure sections of newspapers, and pasted to the ribbon in order, make very interesting moving pictures of this kind, although, of course, any suitable pictures may be used.

A Substantial Electric Radiant Heater

Many electric radiant heaters are made with porcelain cores in several parts, and these are very easily broken. After breaking one of these cores several times, it was found possible to remodel the heater so that the risk of breakage was reduced to a minimum.

A hard-maple block, 5 by 2½ in., was turned in a lathe to the shape shown, the middle part being made 5 by 1½ in., and



the ends turned down to about 1⅞ in. diameter. On each side of this block a hole was bored. A porcelain wall receptacle was obtained, and all the copper lining, except the lower part of one pole, was removed, a type of receptacle that had the screw hole in the center being used. A common porcelain tube was wrapped on one end with asbestos, and this end was glued firmly into the wall receptacle. The wire of the old heating coil was wound around the tube, care being taken to have sufficient space between the turns to prevent short circuits. Both ends of this wire were brought back to the pole screws of the receptacle, one end through a small porcelain tube in the reflector, and the other through the center of the heating-unit tube. The outer covering of the extension cord, but not the insulation, was cut away, and the single conductors were brought through porcelain tubes fixed in the holes in the wooden block, and connected to the pole screws of the receptacle. Soldering the wires to the pole screws made them secure. A thin collar and a clamp screw were used to attach the reflector to the receptacle. An attractive and rigid base was then made of No. 4 copper wire, twisted as shown, and attached to the wooden block with thumb-screws, in such a manner that the heater could be adjusted and locked at various angles. The wire was also brought around the top to hold a wooden handle. The exposed pole screws should be taped and varnished to protect the user.

Book Ends Made of Angle Iron

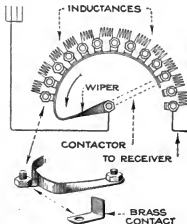
A neat pair of book ends can be made from two pieces of angle iron, the size varying according to the size of the volumes to be supported. The pieces are ground smooth on a grindstone or emery wheel, and then painted or enameled to give them a neat appearance. A layer of felt, glued to the bottom, will prevent them from scratching the finished surface of a table or desk.

Dead-End Switch for Inductances

The efficiency of a radio-receiving set can often be improved to a considerable extent by the use of a dead-end switch to short-circuit the unused turns of the inductance. The switch illustrated can be added to the set without disturbing the existing arrangement, and at a negligible cost. It consists simply of a piece of spring brass, bent as indicated, and soldered to the knob shaft, at the back of the panel.

Small pieces of brass, bent to a right angle, are drilled and fastened under the head of each contact-point screw, to provide positive contacts for the spring-brass wiper. A little care is necessary to insure that each contact piece is placed correctly, and that the wiper is in the proper position, relative to the regular switch contactor, to short-circuit the unused turns and to touch all the contact pieces.

This switch can be used with any multipoint switch in which the points are arranged in an arc, and where contact is made by a rotating switch arm.



Waterproofing Felt Hats

An old hunter uses the following method of waterproofing felt hats: A solution made by dissolving half a bar of common soap in water is liberally applied to the inside of the hat. When this is dry, a second solution, made by dissolving a cupful of powdered alum in water, is brushed on over the first. The soap is thus hardened, and becomes waterproof.

PRIZE OFFERS AND ANNOUNCEMENTS

PEARL NECKLACES OFFERED AS PRIZES FOR BEST TITLES FOR A PICTURE

Local prizes to the value of \$50, and national prizes to the value of \$1,750, are offered by a Chicago jewelry firm for the most appropriate titles for a picture, a copy of which will be furnished on application. The national prize-winning titles will be selected from the winning titles in the contestant's town or city. The local prizes consist of pearl necklaces to the value of \$25, \$15, and \$10, and the national prizes of necklaces to the value of \$1,000, \$500, and \$250. All titles must be submitted by Nov. 20, 1922, on an official blank, which may be obtained, together with a copy of the picture, by application to local jewelers, or by addressing C. D. Peacock, State and Adams Sts., Chicago, Ill.

MANY PRIZES OFFERED FOR RECIPES FOR CHOCOLATE CONFECTIONS

Every person who uses chocolate, or cocoa, for beverages, cakes, candies, or desserts, may participate in a recipe contest in which 100 prizes aggregating \$1,000 in value are to be awarded. In each of the above four classes there will be a first prize of \$100, and for each of the best cake, candy, and dessert recipes there will be other prizes of from \$25 to \$2. The final contest closes Dec. 1, 1922. As many recipes as desired may be submitted, and each recipe must be accompanied by the blue label from a package of the chocolate made by the prize giver, namely, W. H. Baker, Inc., Washington, D. C.

FINANCIAL AID TO TECHNICAL STUDENTS BY EMPLOYMENT IN STEEL MILLS

To assist students working their way through the Carnegie Institute of Technology, arrangement has been made to give them employment in the mills of the Jones & Laughlin Steel Company, of Pittsburgh, Pa. The students may work in the shifts of 10 hours' length, on Friday and Saturday nights, or all day Saturday. This arrangement will not only assist the students financially, but will also furnish them with practical engineering experience that will supplement the theoretical knowledge acquired at the institute.

WINNERS OF THE KNIGHTS OF COLUMBUS PRIZES FOR HISTORICAL ESSAYS

The \$500 prize offered by the Knights of Columbus National History Commission for the best essay on an American historical subject written by a student of an American college or university, has been awarded to Louis Morton Hacker, of Columbia University. The title of the winning essay is "The Genesis of the Interstate Commerce Act." The prize in the contest open to professors of history was won by Samuel Flagg Bemis, of Whitman College, Washington.

\$1,000 IN PRIZES OFFERED FOR SLOGANS BY ELECTRIC TRUCK ASSOCIATION

Concerns interested in the electric-truck industry have set aside \$1,000 to be awarded in prizes for the best slogans not longer than 10 words, indicating the advantages of electric as compared with other trucks. The prizes offered are: First, \$500; second, \$200; third, \$100; and 40 others of \$5 each. Publicity literature in this connection is being circulated by the Electric Truck Association, New York City.

\$2,000 IN CASH PRIZES OFFERED FOR MANY KINDS OF NEEDLEWORK

For crochet, knitting, embroidery, or tatting work done with any cotton threads made in America, prizes aggregating \$2,000 in cash are offered by the Star Needlework Journal. All articles submitted must be newly made for the purpose of entering them in this

contest. There will be altogether 162 class prizes, of from \$100 to \$1 each, awarded, and, in addition to these, three special prizes of \$100 each will be given. Competitors may enter in as many of the classes as desired, but only the winners of the special prizes, will receive more than one prize. The contest will close Dec. 31, 1922. Competitors must fill an entry blank, which may be obtained by applying to Star Needlework Journal, 260 West Broadway, New York City.

CONTESTS PREVIOUSLY ANNOUNCED

Medals, Diplomas, and Money Awards: Announced August issue, 1921; awards offered by the Franklin Institute. The Franklin medal is for workers in technology; the Elliott Cresson is for original research work and invention. The Howard N. Potts is for important development of previous discoveries and inventions. Each award consists of a gold medal with a diploma. There are also a silver medal, and a Certificate of Merit awarded for meritorious discoveries, and cash premiums for certain work in optics.

One Million Francs for Best Motor: Announced January issue, 1922; closes June 1, 1923; address, Aero Club of France, Paris.

Research Thesis by a Woman: Prize \$1,000; announced October issue, 1921; awarded annually; address, Dr. Lilian Welsh, Goucher College, Baltimore, Maryland.

Annual Commercial Airplane Contest for "Italy's Great Trophy": Announced July issue, 1922; address, Aero Club of Italy.

Best Novel by an American Author: Prize \$2,000; announced August issue, 1922; closes March 1, 1923; address, Harper & Brothers, New York City.

Designs for Chicago Tribune Building: Prizes, \$100,000; announced August issue, 1922.

Best Essay on a Historical Novel: Prize \$100; announced September issue, 1922; closes Dec. 1, 1922; address, Kenyon College, Gambier, Ohio.

Competition for American Composers: Prizes from \$1,000 to \$100; announced October issue, 1922; closes Dec. 15, 1922; address, Mrs. Edwin B. Garigues, Room 201, Bellevue-Stratford, Philadelphia, Pa.

Best Symphonic Composition: Prize \$1,000; announced October issue, 1922; closes Jan. 1, 1923; address, Balaban & Katz, 175 N. State St., Chicago, Illinois.

For Musical Compositions: 24 prizes; announced October issue, 1922; closes Dec. 1, 1922; address, The Etude Prize Contest, 1712 Chestnut St., Philadelphia, Pa.

Reward for a Book of Self-Revelation: Prize £250 advance royalties; announced November issue, 1922; closes Dec. 15, 1922; address, Messrs. A. M. Philpot, Ltd., 69 Great Russell St., London, W. C. 1, Eng.

For Best Professional Name for a Young Screen Artist: \$375 in prizes; announced November issue, 1922; closes Dec. 1, 1922; address, Motion Picture Editor, The People's Home Journal, 80 Lafayette St., New York City.

Although France seldom fails to do honor to its great originators, it has suddenly been discovered that one has been neglected—no less a man than Mr. Marcel, the inventor of the universally known "wave." Amends are to be made by the observance of a "Marcel Week," one feature of which will be a "marcel" contest among hairdressers for a prize of 30,000 francs.

On page 305 of our August, 1922, issue, appeared an article entitled "Automatic Gas Lighter for Typetting Machines." This was contributed by F. W. Inversetti, of Ripon, Wis., who claims that the invention is his own.

It now appears that patent No. 568,931, series of 1915, Div. 23, issued to R. S. Starks, Berlin, Wis., controls the manufacture and sale of this device. Our readers are therefore cautioned against its unauthorized use.

When answering prize offers please mention Popular Mechanics Magazine



RUSSIAN CROWN JEWELS HAVE FABULOUS WORTH

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THESE Russian crown jewels have an estimated worth of \$60,000,000,000, according to a French jewel expert who recently appraised this wonderful collection of precious stones in their matchless settings. This valuation, however, is factitious. Nearly all of these gems would lose much of their ascribed value if they were placed on the market, because of their extreme size, weight, and cutting. They are of too great a magnitude for anything but just what they are—crown jewels. For instance, the crown of the late czar, which is shown elevated in the center of the display, contains 32,800 carats of diamonds, of which 12 stones average 30 carats each.

LATEST DEVELOPMENTS IN SCIENTIFIC RESEARCH

MILLIONTH SECOND COUNTS IN GEODETIC-SURVEY WORK

Can you measure time accurately to one-millionth of a second? Can you devise a simple apparatus for carrying into the field which will time events with such precision? This is a practical question. If you can achieve this, you can be of service in increasing the efficiency of the United States Coast and Geodetic Survey, which is the branch of the government concerned with the problems of the earth—its size, form, and many other of its physical particulars.

Scientists and engineers depend upon this institution to determine the value of gravity in different parts of the country, which enters into most of their physical units, such as those used for determining the strength of a bar of steel or the horsepower of an engine. Gravity is now determined from the time of swing of a special form of pendulum which is carried about and allowed to vibrate at the stations chosen for the purpose. The time of swing is determined with the high degree of precision necessary, by counting the number of swings which take place in a period of many hours. For this purpose the equipment includes an imposing array of astronomical instruments for obtaining the time from the stars. This apparatus has to be installed on masonry piers and adjusted and used with special care, which de-

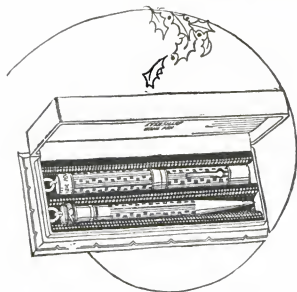
mands training and skill beyond the experience and conception of the ordinary person. Moreover, in order to verify the work and insure the absence of disturbing elements and consequent errors, the observations must be repeated a number of times. In fact, the determination of gravity is scientific work of the highest character, and the exactness with which time has to be measured corresponds to about one part in a million. An error of one-tenth of a second in ten hours is too great. Furthermore, bad weather obscuring stars with clouds stops the work.

The Coast and Geodetic Survey is anxious to increase the precision which has been obtained by improvements which will increase the efficiency. If an arrangement can be devised which will permit the swing of the pendulum to be determined to a millionth of a second, it will be necessary to swing the pendulum only for one or two seconds; and instead of ascertaining the value of gravity at three stations a month, it will be possible to get at least ten times this number.

Maj. William Bowie, in charge of this work, believes that the required timing methods as well as a portable equipment, weighing far less than the present outfit of 1,500 pounds, and dispensing with astronomical paraphernalia, can be devised eventually, but he is anxious to determine whether or not it can be developed with present knowledge and facilities.

IN accordance with the editorial policy of this magazine never to accept compensation in any form for what appears in our reading pages, and also to avoid all appearance of doing so, we are obliged to omit the name of the maker or the seller of any article described. This information, however, is kept on file and will be furnished free, by addressing Bureau of Information, Popular Mechanics Magazine, Chicago. [Editor.]

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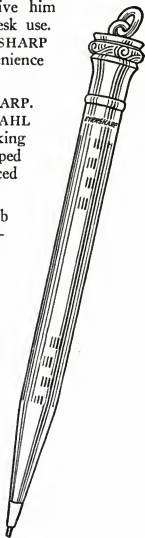
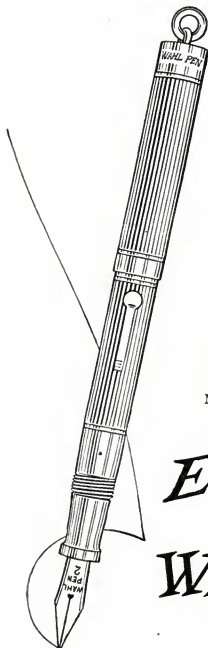
Give EVERSARP—and your gift is supreme in quality; no other pencil has the exclusive rifled tip that keeps the lead from wobbling. Even if he has an EVERSARP, give him another for his watch chain or for desk use. Ladies, from fourteen up, wear EVERSARP on a ribbon, chain, or cord, for convenience and style.

Give WAHL PEN to match EVERSARP. The indestructible all-metal barrel of WAHL PEN holds more ink, positively prevents leaking and will last forever. The iridium-tipped point writes as smoothly as a 2B lead. Priced as low as \$4.

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The Dollar

The daily actions of most of us are influenced by the messages received over the telephone, and yet few of us stop to think of the men and women, and the mechanisms, which help to make that daily service possible.

Maintenance, repairs, and the work of handling calls, must constantly be carried on in good times or in bad, and they must be paid for, in order that your telephone service may be continued.

The average dollar will buy to-day less than two-thirds of what it would buy before the war. This

means that it costs, on the average, half as much again to buy most of the things that are necessary for keeping the country going; but the advance in telephone rates is far less than this average.

In fact, gauged by the present purchasing power of the dollar, telephone service in the country as a whole is costing the subscriber less than it did in 1914.

The Bell System generally has been able to meet higher commodity prices and increased wages by means of new economies in operation and the increased efficiency of loyal employees.

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Truly a token of high esteem. And totally unlike any gift of any Christmas gone by.

THE Ansco Memory Kit—a pleasing assembly of high-quality equipment wherewith happy memories of people, places, and episodes may be perpetuated in pictures.

These three things make up an Ansco Memory Kit: (1) Your choice of three fine Ansco Cameras, as set forth in the paragraphs at the right; (2) a supply of

Ansco Speedex Film; (3) a handy and supremely handsome compartment-receptacle of solid mahogany, for keeping camera and extra films always conveniently together; the lid embellished with a burnished metal nameplate for the recipient's name or initials.

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Ansco makes a complete line of Cameras, ranging from \$1.50 to \$65—each model a standard for quality and value at its price.

Have you tried the new Ansco Speedex Film? "Fits the light, dull or bright"—a better film that gets better pictures.

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Patent
applied for

At \$15

—the camera compartment of the Memory Kit contains the widely popular Ansco Vest Pocket Junior—a remarkably capable little camera that is producing fine pictures the world around. By an exclusive device it combines a fixed focus with an adjustable focus, providing for both beginners and skilled users. Special finish, Rapid Rectilinear Lens, Speed U.S. 4, in Delux Shutter. *In Canada, \$16.*

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—the Memory Kit includes the Ansco Vest Pocket Junior in special finish equipped with the brilliant Ansco Anastigmat Lens, Speed F. 7.5, in Gammax Shutter.

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—it's an Ansco Vest Pocket Speedex No. 3—a camera of the highest grade and widest efficiency, yet in compact size. Ansco Anastigmat Lens, Speed F. 6.3.

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B14—Superior fine Diamond in beautiful hand-engraved Platinum ring.....\$100



B15—Gent's hand-carved Belcher Ring set with fine blue-white Diamond.....\$45



B16—Sweet Engagement ring set with fine blue-white Diamond.....\$35



B17—Sweetheart Platinum ring set with superior fine Diamond.....\$150



B18—Unique Platinum top Green Gold ring set with 1 fine Diamond.....\$40



B20—Beautiful laval-here genuine pearls, fine Diamond.....\$28



B19—Solitaire Cluster, 7 fine Diamonds set in Platinum.....\$65



B21—Four White Gold inverted hearts are set with 1 superior quality sparkling Diamond.....\$75



B22—Ladies' Belcher ring set with 1 fine Diamond.....\$25



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X38—14K, Solid White Gold case with sapphire jewel crown, 15 jewel, Rectangular adjusted movement. Fancy engraved Dial. Special Price.....\$32.50

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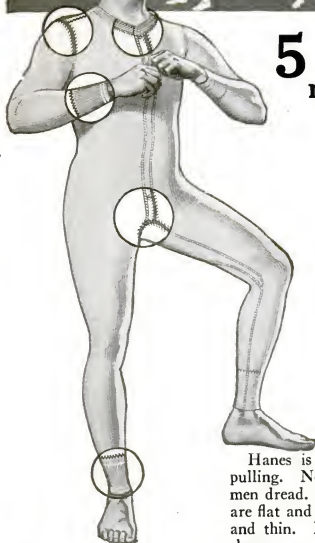
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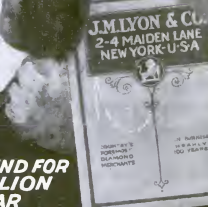
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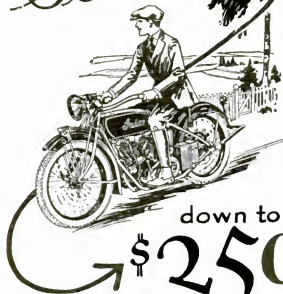
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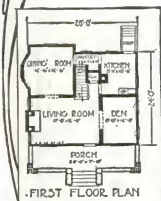
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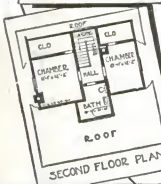
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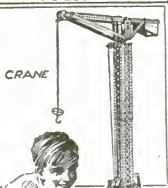
Free Book of Plans

Begin with this on
MONDAY



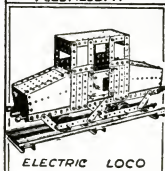
HIGH
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This Model on
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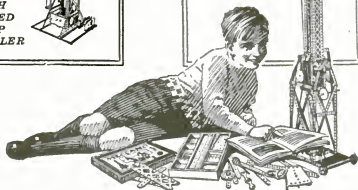


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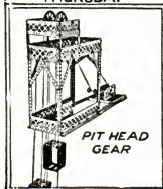


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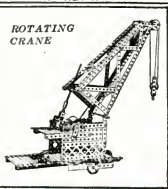
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And this on
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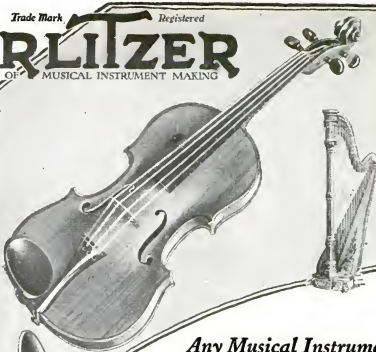
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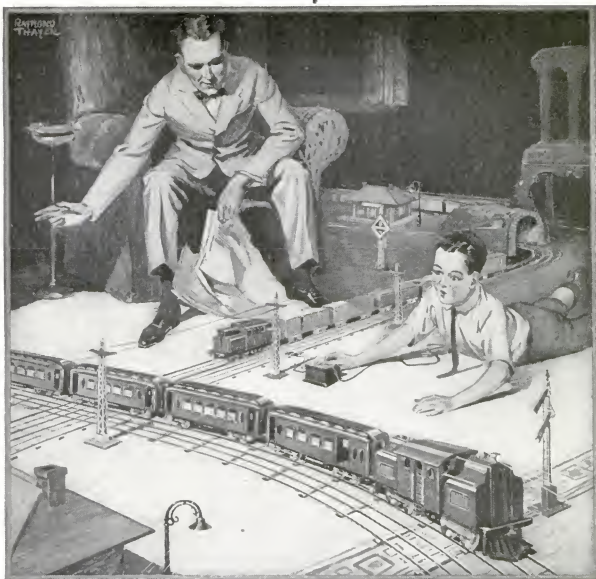
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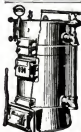
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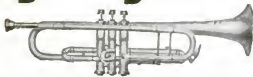
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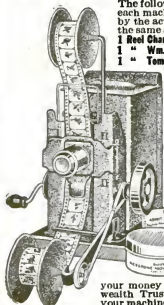
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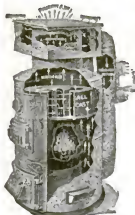


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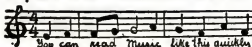
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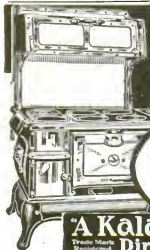
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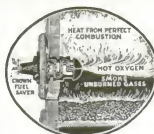
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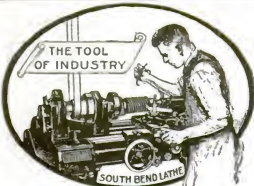
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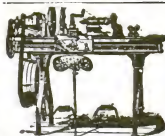
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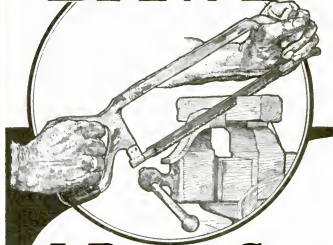


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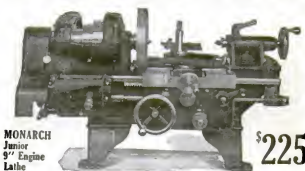
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32 x 4	10.45	16.75	35 x 4 1/2	14.45	23.95
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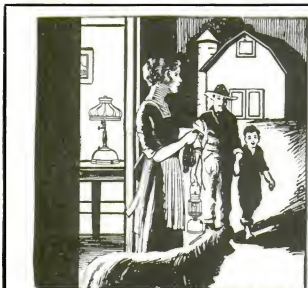
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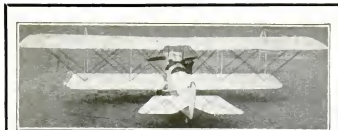
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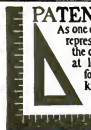
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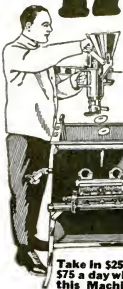
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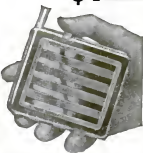
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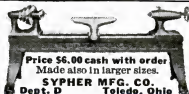
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BARTLETT DROP-FORGED SNIPS \$2.70 to \$9.50

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1-14 inch. Cuts 1 inch stock easily. Specially designed base encloses saw and provides self-employing dust shroud. Adjustment screw elevates top for grooving. Cuts maximum groove 1-8 in. wide. All parts nicely finished. Grease up lubrication. Easily operated with 1-6 H. P. motor. Adapted for small shops or home use. Speedy and accurate—precision adjusted. Nothing to get out of order. High grade in every respect—Fully guaranteed. Send today. Money back if not satisfied.

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Jr. Radio**

\$4.95

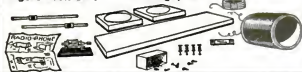
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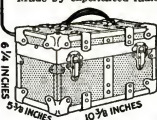
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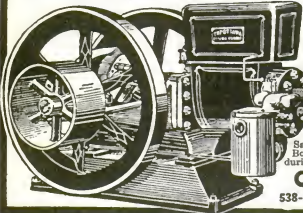
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No. 300—\$3.25
No. 400—4.00
No. 500—4.50
No. 600—5.00
Long or short styles

Ideal Christmas Gift

Banks, trust companies, and similar institutions will find the Security pen a splendid gift for customers or employees.

If your dealer cannot supply you, mail this coupon

KRITIKSON BROS., Inc.
122 W. Illinois St., Dept. P, Chicago, Ill.

Gentlemen: Enclosed check or money order—please send me one Security pen, No., guaranteed for five years.

Style of point preferred
☐ Fine ☐ Medium ☐ Coarse ☐ Med. Stub ☐ Broad
☐ Stub ☐ Steno ☐ Posting, in flexible, or stiff ☐ action,
long, or short ☐ model.

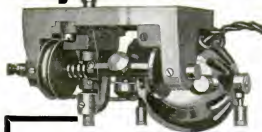
Name.....

Address.....

AGENTS WANTED We have an interesting proposition to offer to high grade specialty salesmen for the distribution of security pens. Upon request we will furnish full information regarding exclusive territory.

KRITIKSON BROS Inc
CHICAGO ILLINOIS

Only 227 Motors



Left at
\$10

Each

Ideal for home-made phonographs, experimental purposes and combination **phonograph-radio** sets.

We have 227 small motors which are greatly under-priced for quick clearance. You will never again equal this low price, when this lot is sold.

They are universal motors, 110 volts, 60 cycle single phase, complete with turntable, cord and socket for immediate use. 1400 R. P. M. Motor has 1" pulley with flange for $\frac{3}{4}$ " flat belt. Housed in highly polished, nickel-plated shell.

Don't lose out on this remarkable offer. Order your motor today. Tomorrow may be too late. **DO IT NOW!** Price in U.S.A., \$10.00 f. o. b. Steger, Illinois. Foreign \$12.50.

Industrial Division

Steger & Sons Piano Manufacturing Company
Dept. 94, Steger Building Chicago, Illinois

Starting a Company?

Save expenses and taxes by organizing on the popular, **COMMON LAW** plan under a pure **DECLARATION OF TRUST**. No experience required to fill in **DEMAREE STANDARD FORMS**, issue shares and begin doing business at once. Genuine **DEMAREE FORMS** are nationally known, approved by attorneys, and utilized by successful concerns throughout the United States. Send for large, free pamphlet (D-53) containing valuable information that you may need. C. S. DEMAREE, legal blank publisher, 708 Walnut, Kansas City, Missouri.



DIAMONDS WATCHES CASH OR CREDIT

"SYLVIA"
Diamond Ring
Blue white, radiant,
perfect cut diamond.
The ring is 18-K Solid
White Gold, carved and
pierced. Extra special
at \$100. Credit terms:
\$2.50 WEEK
Others at \$75,
\$150, \$200
up.

Genuine Diamonds GUARANTEED
15 DAYS FREE TRIAL
This exquisite Diamond
ring is only one of a multitude of fancy and conservative designs at bargain prices fully described in our

Free—Large Catalog
Every article ideally suitable
for Christmas Gifts or personal wear and sold on

LIBERAL CREDIT TERMS
of one-fifth down, balance in equal payments within eight months. Satisfaction or your money back.

Liberty Bonds Accepted

LOFTIS
BROS & CO. 1123

THE OLD RELIABLE CREDIT JEWELERS
Dept. 5-884
108 N. State St. CHICAGO, ILL.
Stores in Leading Cities

Jewel 22 in. Band Saw \$75

Here's the machine for your shop at a moderate price. Strongly constructed to last a lifetime. Angle-steel frame, electric welded. Build on your own bench-top to suit your special needs. Roomy table with tilting adjustment for sawing bevels. Band saw has 22 in. swing cutting to center of 44 in. circle. Hand-wheel tension regulator. Will take material up to 7 in. thick.



Price with $\frac{3}{8}$ in.
band saw, \$75.

Send for complete catalog of Parks machines

THE PARKS BALL BEARING MACHINE CO.
1500-1540 Knowlton Street CINCINNATI, OHIO
Canadian Factory, 200 Notre Dame East, Montreal 48

PARKS

WOODWORKING MACHINES



Build This Phonograph Yourself

TREMENDOUS SAVING IN COST

Easy, fascinating work with our **SIMPLIFIED PLANS**. We furnish blue prints, diagrams, motor, cabinet pieces, ready-built horn, etc. You need not be a cabinet maker. A few hours assembling and you will have a fine instrument at one-quarter the regular retail price. **AGENTS MAKE MONEY** making and selling these instruments. We're today for full details and our **FREE OFFER**. Address: **MODERN PHONOGRAPH SUPPLY CO.** 213 N. Morgan St. Dept. 703 CHICAGO, ILL.

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\$50 buys a brand new Corona, the Personal Writing Machine. Fold it up, take it with you, typewrite anywhere! Write for free booklet No. 8.
Corona Typewriter Co., Inc.
GROTON, N. Y.

YOU'LL LIKE "LYON" BODIES

For Fords, Chevrolets and Dodges

\$68.50

(For Fords)
Painted with
hood and special
shell as shown.
\$22.50 additional
for Chevrolet.
\$50.00 additional
for Dodge.

SEND NOW
for our complete
illustrated
body and accessory
catalog.



Below is a list of bargains
we are offering this
month. Order now.

	List	Net		List	Net
3 in. Gear	\$12.50	\$ 5.95	Individual sport fenders	\$25.00	\$13.95
Drummed lamps	12.00	5.75	Two for Ford wheels	12.00	5.90
Underlump parts	15.00	7.25	Nickel side lamps	5.00	2.85
Mott wire wheels			Top and windshield to fit body	60.00	35.00
(demountable)	60.00	36.50			

Dealers will find a ready sale for our bodies. Buy direct from the factory.
AUTO TIRE SALES CO., Dept. P.3.
1346 S. Michigan Ave. Body Division Chicago

Baby Grand Lathes

FOR METAL OR WOOD HIGHEST QUALITY—LOWEST PRICE

A precision machine tool at a price within the reach of everyone, everywhere.

A Practical Tool for Universal Use

A dependable, low priced lathe for use by those engaged in light manufacturing, model making, experimenting, repairing, etc., as well as the requirements of the amateur, the inventor and the student.

Ideal For Use in the Home

Interesting, instructive and profitable employment for your spare time.

Develop Your Ideas in Private

Build your experiments in models with your own hands.

Add \$5 to Your Income

In spare time make salable product, radio equipment, Xmas gifts, etc.

Lasts a Life Time

A sturdy machine built for real work.

Write NOW
For Prices
and
Details

6-in.
Swing
12 in.
or
18 in.
Between
Centers
20 in. or
26 in.
Bed

THE WATSON MFG. CO.
32 Post Street, Toledo, Ohio, U. S. A.

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SPECIAL OFFER
Fordspaced Equip-
ment. Tremendous
Reductions

Ford Sport Bodies,
Beautiful, Highgrade Models
\$37.50 up

8-16
Overhead Valves
Selective Transmissions

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	Price Now	Price Now	Price Now
Dials, Conves, enameled	\$ 2.25	\$1.65	Underlugs Fictures
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MOTORCYCLES ONE YEAR TO PAY

Know the joy of owning—for business or pleasure—a HARLEY-DAVIDSON, EXCELSIOR, HENDERSON, INDIAN, CLEVELAND, or any other standard make; thoroughly rebuilt in our own factory.

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America's Largest Cycle House

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FREE Tells how experts hatch, feed and raise poultry for profit. Also quotes low prices on baby chicks, pure bred poultry, eggs for hatching, incubators, Mammoth hatchery, poultry supplies, etc. Fully illustrated. Write today.

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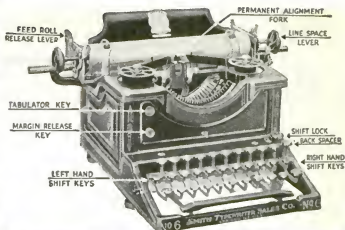
Why Burn Coal

When you can get twice the heat at half the cost, by installing, in 5 minutes time, Uni-Hete Oil-Gas Burner in your range or heater. Thousands of homes now ending coal expenditure Uni-Hete generates gas from common kerosene—cheapest fuel known. Red hot fire instantly. Cooks, bakes, heats. Sets in fire box of any stove. **FREE TRIAL.** Saves its small cost in 30 days. Lasts for years. Made by factory making heating devices for 35 years.



Agents—Special Offer—Act Quick
High coal cost makes Uni-Hete a big profit maker for agents. Write at once.

Acorn Brass Mfg. Co., 1267 Acorn Bldg., Chicago, Ill.



TYPEWRITER SEISA

Free Trial—Use as You Pay

Send us only \$4.00 a month until the low total price of \$48.85 is paid, and the machine is yours.

This is absolutely the most generous typewriter offer ever made. Do not rent a machine when you can pay \$4.00 a month and own one. Cash price \$44.00, just a little less than half its original price.

(STANDARD) SMITH Model No. 6

Perfect machines, Standard size, Keyboard of Universal arrangement, writing 84 characters. The entire line of writing completely visible at all times, has the tabulator, the two-color ribbon, the back spacer, in fact every late style feature and modern operating convenience. Comes to you with everything complete: tools, cover, operating book and instructions—nothing extra to buy. You cannot imagine the perfection of this beautiful reconstructed typewriter until you have seen it. We have sold thousands of these perfect late style machines and every one of these thousands of satisfied customers had this beautiful, strictly up-to-date machine on five days' free trial before deciding to buy it. We will send it to you F. O. B. Chicago for five days' free trial. It will sell itself, but if you are not satisfied that this is the greatest typewriter you ever saw, you can return it at our expense. You won't want to return it after you try it, for you cannot equal this wonderful value anywhere.

SEND NO MONEY Put In Your Order Now

**\$4.85
AFTER
TRIAL**

When the typewriter arrives deposit with the express agent \$4.85 and take the machine for five days' trial. If you are convinced that it is the best typewriter you ever saw keep it and send us \$4.00 a month until our bargain price of \$48.85 is paid. If you don't want it, return it to the express agent, receive your \$4.85 and return the machine. We will pay the return express charges. This machine is guaranteed just as you paid \$100.00 for it. It is standard. These typewriters are samples the manufacturer had at their branch offices throughout United States and have never been used except for demonstration purpose. Just like new but at extremely low price. The supply at this price is limited, the price will probably be raised when next advertisement appears, so don't delay. Fill in the coupon to-day—the typewriter will be shipped promptly. There is no red tape. We employ no solicitors—no collectors—no chattel mortgage. It is simply understood that we retain title to the machine until full \$48.85 is paid. You cannot lose. It is the greatest typewriter opportunity you will ever have. Do not send us one cent. Get the coupon in the mails to-day—sure.

SMITH TYPEWRITER SALES CO., Dept. 288, 360 East Grand Ave., Chicago, Ill.

SMITH TYPEWRITER SALES CO., Dept. 288, 360 East Grand Ave., Chicago, Ill.

Ship me the Standard Visible Smith Model No. 6, F. O. B. Chicago, as described in this advertisement. I will pay you \$4.00 monthly as rent until the \$44.00 balance of the Special \$48.85 sale price is paid. The title to remain in you until fully paid for. It is understood that I have five days in which to examine and try the typewriter. If I choose not to keep it I will carefully repack it and return it to the express agent. It is understood that you give the standard guarantee.

Name

Street Address

City..... State.....

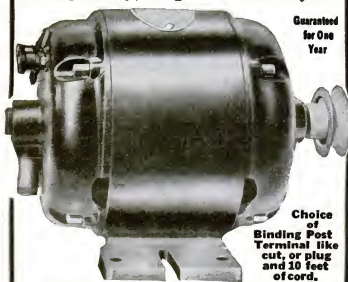
Occupation or Business

THIS BIG $\frac{1}{4}$ H. P. MOTOR A Little While \$13.50 Longer at . . .

(No Telling When Prices Will Advance)

Steadily increasing cost of fuel, power, labor and material may force us to raise our price on this big, sturdy, 28-lb., 60 cycle split-phase A. C. Motor; but we'll hold the price down to this competition-defying level as long as we can.

A wonderful fan-cooled, squirrel-cage motor, tested for 50% overload before leaving factory, and guaranteed for 1 year.



Guaranteed
for One
Year

Choice
of
Binding Post
Terminal like
cut, or plug
and 10 feet
of cord.

Its speed of 1740 r. p. m. fits it exactly for such service as drills, small lathes, fans, blowers, forges, household washing machines, cream separators and all forms of motor drive calling for $\frac{1}{4}$ h. p. and a capacity for temporary overload.

Prices F. O. B. Chicago

110 volt, 60 cycles single phase A. C.	\$13.50
220 volt, 60 cycles single phase A. C.	\$14.50
110 volt, 25 cycles single phase A. C.	\$15.50
32 or 110 volt direct current	\$16.00

Combined Grinder and Buffer \$25.00 Complete With Above Motor



Machine has hand-on-and-off lever in front, with switch enclosed in and protected by base. Grinding wheel is 6 in. in diameter, with $\frac{1}{2}$ in. face; Buff 7x $\frac{1}{2}$ in. unsewed. Motor is same as described above except that it is totally enclosed and dust proof.

Also ask for our line of Motors and Generators for RADIO Service.

Send Cash with Order, as these low prices permit of no booking, billing or collection expense. Our money-back plan and our guarantee fully protect you.

NORTHWESTERN ELECTRIC COMPANY
408 So. Hoyne Ave. Chicago

**HIGH GRADE
LEVER
WATCHES**

For Men and Boys

**10 DAYS
FREE
TRIAL**

**LUMINOUS
DIAL**

1 BUSINESS OR SPORT WATCHES 2

Don't miss this opportunity to purchase one of these fine elegant TIMEPIECES at less than HALF OF ORIGINAL PRICE. High Grade nickel lever movements, scientifically built, jeweled, adjusted and regulated. No. 1 MEN'S WRIST WATCH Oatze round nickel case, 10 Jewels, RADIUM DIAL, \$5.95; or solid Sterling Silver, \$7.75. No. 2 Nickel Cushion Shape, \$7.85; or solid Sterling Silver, \$10.75. With 15 Jewel Movements, \$1.00 extra. Free: 2 fine leather straps. No. 3 EXTRA THIN MODEL GENTS WATCH, 14 size, 2 Jewels, GOLD FILLED, GUARANTEED 10 years, \$7.95; or 20 yr. case, \$9.75; or Nickel case, \$5.25. With 15 Jewel movement, \$1.00 extra. FREE: Gold filled leather straps.

SATISFACTION GUARANTEED OR MONEY REFUNDED
Watches are our EXCLUSIVE SPECIALTY. Buy your watch from WATCHMAKERS. You will save money and get a better watch. Order today, pay on arrival. If you are not entirely pleased after 10 days' trial return watch and we will exchange it or refund your money. Illustrated FACTORY PRICE LIST of Ladies' and Gents' watches mailed free.

UNEEDA WATCH CO., Dept. P, 217 Eighth Ave., NEW YORK CITY

30 DAYS' FREE TRIAL TO FORD OWNERS SEND NO MONEY

HASTINGS STABILIZER



MAKES FORD DRIVING STEADY

stabilizing devices. At the end of 30 days you send it back—or, send us \$3.75.

Special 30 Day Trial Offer. Our dealers are authorized to sell genuine Hastings Stabilizers at this price and on this 30 Day Free Trial basis. Get your Hastings Stabilizer now from your dealer or the

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**AUTO SUPPLIES
WHOLE SALE
3000 BARGAINS**

**SEND FOR THIS
CATALOG—
it's FREE!**

Everything you need
in Auto Supplies at
Amazingly LOW PRICES.

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**SLOW
LOR**

AGENTS Make Big Money

Selling D-REX-U Safety Signal to automobile owners; complies with safety laws; guaranteed. Write today for wholesale price to agents and get territory quick. Big Winter Seller. Address Comstock-Bolton Co., Dept. K, 1925 E. 15th St., Kansas City, Mo.

Lost Your Keys?

One way to avoid this inconvenience is to supply yourself with a set of 5 DEVIL'S COMBINATION MASTER KEYS, which by action has opened over 100,000,000 Locks. Used to great advantage throughout the most popular nations. The most wonderful set of 5 MASTER KEYS in the world. By mail \$1.20.

S. URICH KEY CO.
232-3rd Street, Milwaukee, Wis.
Largest Exclusive Key and Lock Shop in America



Help Her to Save More Lives

Last year over 100,000 lives were saved with the aid of Tuberculosis Christmas Seals. Tuberculosis is being controlled. The death rate has been cut in half. If you and others join the fight, it can be stamped out.

Buy Christmas Seals. When you see someone selling them, help the fight along by buying all you can.

Your help, the help of every happy, healthy person, is needed; and it will count.

Stamp out
Tuberculosis
with
Christmas
Seals



THE NATIONAL, STATE, AND LOCAL
TUBERCULOSIS ASSOCIATIONS OF
THE UNITED STATES

Please Mention Popular Mechanics

A Home and Income For You in Sunny Florida



Be Independent—Own a Grapefruit and
Orange Grove—A Truck or Poultry
Farm. Increase Your Income

You Can Start a Grove Today Under
Our New Plan

Develop a profit-earning fruit farm without leaving your present position—provide for your future. A small payment now and a few dollars invested each month.

A profit-producing fruit grove is a permanent investment and provides protection against old age.

**THE RIGHT LAND
IN THE RIGHT LOCATION AT
THE RIGHT PRICE**

We Have It—Any Size Farm

These splendid lands are suburban to Tampa, the metropolis of South Florida. Here you find the most healthful, the most delightful climate in North America. For ten years we have been right here helping develop Hillsboro—the banner agricultural County of Florida, and we are still here to serve you and to help you obtain the farm you want, on very easy payments extending over 2 or 3 years' time to suit.

Groves Developed for Non-Residents

If you want to remain in your present position for a few years we can develop a grapefruit and orange grove for you. When you are ready we will clear your land, furnish fruit trees, plant and care for your grove until you are ready to look after it.

**We Raise Our Own Guaranteed Citrus
Trees in Our Own Nurseries**

This insures every purchaser the best fruit trees that can be grown. This also insures a successful grove. We can save you money on planting and caring for your grove.

\$300.00 to \$500.00 Per Acre Profit

This is not an unusual return for truck farmers in the Famous Tampa district. All kinds of vegetables can be grown. Big prices are paid for early potatoes, winter cabbage, Bermuda onions, tomatoes, celery and dozens of other vegetables during the Winter and early Spring, when the north is covered with ice and snow. Strawberries, Nelonas, and other small fruits also yield large profits.

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IT COSTS YOU NOTHING TO LET US PROVE TO YOU that we have the land you want—in the location you want—at a price you can afford to pay and on the easiest terms you can imagine. Let us show you.

Fill out and mail us the coupon today and receive our large descriptive book FREE!

NORTH TAMPA LAND Co.

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Coupon for FREE Book on Florida

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Suite 510 Monon Bldg., CHICAGO**

Please send me your large illustrated Book, "The Call of the Southland," on choice Citrus Fruit and Truck Farms suburban to Tampa, Florida, and information on how I can have a grove developed on the monthly payment plan. P.M. 12-22.

Name.....
St. No.....
City.....
State.....

Complete Regenerative Radio Receiving Set

Manufactured under Armstrong License U. S. Patent 1,113,149

Everything you need—No parts to buy. Comes with easily followed directions so you can set it up and listen to concerts, operas and lectures, news items, stock reports and bedtime stories for the children.

310 sending stations throughout the country supply programs every afternoon and evening.

EASY PAYMENTS—\$15 down—\$10 month

The **SENSITONE** is equal to any complete set you could buy at \$150.00, yet our price is only \$95.00 and you can pay for it \$15.00 down and \$10.00 month, or if you prefer send \$90.00 cash.—*Enjoy it while paying for it.*

ORDER TODAY—You are buying from a reputable concern rated in Dun & Bradstreet's or any bank will tell you.

Folder on request

HAROLD R. WAKEM & CO., 835 Washington St., CHICAGO

BUY DIRECT FROM MANUFACTURER

Listen to the Outside World on a Micro-Phone Crystal Detector Set



The most wonderful one-piece Cast Aluminum Radio Receiver Set manufactured at a price within the reach of everyone. Long winter evenings made one of joy and entertainment. The best and most appreciated Christmas gift to any member of the family.

Special Price while \$500 best O-Phone Radio parts at a saving of 10%.

Send 10c in stamps for 40 of the latest booklets.

ALDINE RADIO & MFG. CO., Aldine Square, Dept. F12, Chicago, Ill.

ELEGANT 7-JEWEL WATCH



C.O.D.

This handsomely designed thin model 7-jewel watch for only \$7.95. Genuine gold filled case; open face; screw back and bezel; stem wind and set.—A dainty watch and fine timekeeper of exceptional value. Guaranteed to wear for years.

FREE with order. **SEND NO MONEY.** Pay on arrival only \$7.95. If not delighted, return at once and get your money back on our ironclad guarantee. Jewelry and gem cutters free.

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Under the table, down in the cellar, into a trunk or any old place. With our **VENTRILLO** which fits into the mouth you can have lots of fun fooling your friends. Also full instructions in the art of Ventriloquism, and big book of jokes. Sent by mail for 10 cts. Stamps or coin.



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Two instruments and 2 Codes in a box. Can Telegraph from room to room or house. Full instructions. By mail 12 cents.

RADIO

\$15 Down
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SENSITONE Long Distance Receiving Set

NEW INVENTION!!

For Seekers of

Health Beauty Power

At last! Elco Health Generators are ready! Get our book about them. Leave bad health and weakness behind forever. These great inventions generate Violet Rays, Vibration, Electricity and Ozone—combined or separate. 4 greatest curative agents. Operate on electric light or on their own power.

FREE BOOK—Ask for the book about these inventions. Tells you how an Elco Health Generator re-vitalizes you.

Send for the book today

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442-448 N. Wells St., Dept. 1359, Chicago

FREE TRIAL

Cut out and mail this ad to us with your name and address—send no money—and we will send you this fine Razor for 30 days' FREE trial. When satisfied after using, send \$1.95 or return razor. Order today.

AMERICAN RAZOR WORKS, Dept. N-3
1575 Ogden Ave., Chicago

Our BUREAU OF INFORMATION will answer all questions regarding articles appearing in this magazine. Address Bureau of Information, Popular Mechanics Magazine, Chicago.

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UP IT GOES!

Climbs in the air by its own power. The propeller spinning automatically at a lively rate.



Invisible Ink

Letters written with this ink look like blank paper. Can be brought out plainly by heating over lamp or stove. Bottle in wooden box, 10 cents.

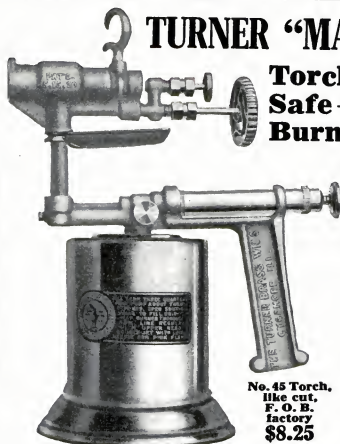


SKULL RING



The eyes in this ring are either Emeralds or Rubies and would scare the timid. Either Roman Gold or Oxidized Silver. 25c by mail.

All the Above by Mail for 50c. Stamps or Coin.
UNIVERSAL DISTR., Dept. 705, STAMFORD, CONN.



TURNER "MASTER" BLOW TORCH

**Torch of a Thousand Uses
Safe—Speedy—Economical
Burns Kerosene or Gasoline
400° More Heat**

For brazing, soldering, lead-burning, paint-burning, light heat-treating, thawing frozen pipes and countless other uses—amateur or professional.

"HOT SPOT HUMP" in combustion chamber, converts low grade fuel into hot, dry gas. (Turner Patent)

SEPARATE NEEDLE VALVE prevents enlarging orifice (so common an occurrence with ordinary torches.)

SAFETY VALVE AND AIR RELEASE prevent explosion and avoid fuel leaks. (Turner Patent) Only one opening in Tank, (and that above fuel line).

COST NO MORE THAN ORDINARY TORCHES.

THE TURNER BRASS WORKS
Sycamore, Ill. U. S. A.
Cedar Street

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When you write, give us name of your dealer

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New untrodden field. Contractors prefer to sublet floor surfacing to American Universal Contractors. Machine does work of 6 men. Works quickly, easily. We set you up in business of your own, furnish office forms, advertising, etc.

Make \$5,000 to \$15,000 or More—Yearly

Prepare for big building boom. Make new floors perfect, old floors like new. Every floor a prospect. Big money in old floors. No town too small. Beginners often pay for machines first month with profit besides. Get full information.

THE AMERICAN FLOOR SURFACING MACHINE CO.
523 So. St. Clair St. Toledo, O., U. S. A.

Health? Take Turkish Bath



at Home—Only 2 Cents

Physicians are abandoning drugs for this new treatment. If your mind or body is tired, open your pores and feel the rapid change in your condition, at cost of 2c a bath. The Robinson Bath Cabinet is the only scientifically constructed bath cabinet ever made for the home. **Great \$2 Book sent Free.** "The Philosophy of Health and Beauty." Write Today. Agents Wanted, The Robinson Household Mfg. Co., Room 1687, Huron & Cherry Sts., TOLEDO, O.

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I know because I was Deaf and had Head Noises for over 30 years. My invisible Antiseptic Ear Drums restored my hearing and stopped Head Noises, and will do it for you. They are Tiny Megaphones. Cannot be seen when worn. Effective when Deafness is caused by Catarrh or by Perforated, Partially or Wholly Destroyed Natural Drums. Easy to put in, easy to take out. Are "Unseen comforts." Inexpensive. Write for Booklet and my sworn statement of how I recovered my hearing.

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Seneca, Kodak, Premo, Ansco or Ingento Shutters repaired and adjusted. Any style or size. Expert work done and guaranteed. Prompt Service. Reasonable Prices. Send your shutter in today.

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SENECA CAMERA MFG. COMPANY
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with something in it for you
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ULTRA-LENS MICROSCOPES

Give enormous magnification at low power. Made possible by a new system of lens construction on which patents are pending. Powers from 2,500 to 250,000 times surface area (50 to 500 diameters) are available. Especially suited for students, experimenters or anyone scientifically inclined. Will duplicate work of instruments of a dozen times their cost. Complete outfit at \$3.00, \$4.00 and \$5.00 according to number of objectives furnished. Shipped postpaid and guaranteed. Interesting circular PM sent on request.

At dealers or by mail direct.
THE SPECIALTY MFG. CO., Reg. MILTON, PA.

Watch Charm Pistol

SILVER AND GOLD
PLATED

WITH 24
CARTRIDGES \$2.55



ACTUAL SIZE

No. 309

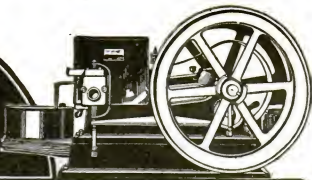
The very latest and most unique novelty out. This miniature "Break Open" pistol is the smallest pistol in the world—shoots blanks and makes loud report like a regular 25 Cal. gun; can be used as watch charm; appeals to every sportsman and arouses the interest of all. Made of hard metal beautifully finished in silver and electro plated in 14k gold, with charm ring attachment. Rush your order with remittance, \$2.55, today or you will be disappointed. No C. O. D.'s accepted. Quantity limited. Going fast.

First Come—First Served. No others obtainable.

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2 H-P. Chas. Beaulieu, Wis., says: "Good as the first day I had it."

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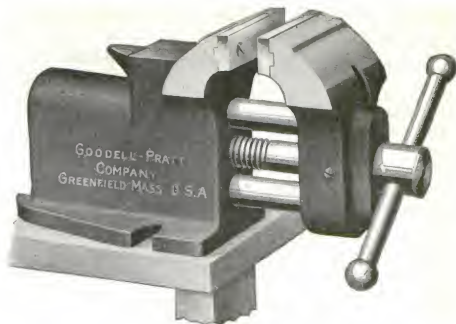
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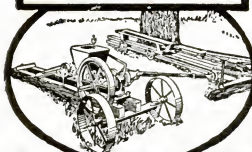
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THE whole world of electricity is open to the Coyne trained man. He is trained completely. He can make big money as power Plant Operator, Superintendent, Telephone man, Construction worker, auto truck or tractor electrician, battery man, radio expert, or he can go into business for himself as electrical contractor, dealer, auto ignition or battery expert and make from \$3,000 to \$20,000 a year. Hundreds of our graduates today are making big money and you can do the same if you grasp this opportunity—act now.

Earn \$150 to \$400 a Month

No books or useless theory. You are trained on \$100,000 worth of electrical equipment. Everything from door bells to power plants. You work on motors, generators, housewiring, autos, batteries, radio, switchboards, power plants—everything to make you an expert ready to step right into a position paying from \$45 to \$100 a week. Learn electricity in the electrical center of the world. Send the coupon today for free catalog.

Big New Home

The increasing popularity of Coyne and a tremendous influx of new students simply forced us to move into larger and more spacious quarters. Here, in the big, new home, you will find added electrical equipment—new and larger departments—a more complete electrical training—a school thoroughly equipped to train you for a big paying position.

Radio Course FREE

We include the following free with your regular course:

- (1) A complete course in auto, truck and tractor electricity and storage batteries. Greatest outlay of auto electrical and battery equipment in the country.
- (2) Course in Radio—the marvel of the age. Constructing, installing and operating. You can build your own wireless telephone set.
- (3) A life scholarship in the Coyne School. You can stay as long as you wish and return for further training at any time in the future. The aim of the Coyne School is to turn out men completely trained in all branches of electricity—capable of succeeding in the highest paid positions.

Earn While You Learn

We help students to secure jobs to earn a good part of their expenses while studying.

Send Coupon NOW!

Don't delay a minute—send that coupon in **right now** for our big free catalog and full particulars of this wonderful offer—Act Now—Make up your mind to come to Coyne to learn electricity. Send coupon today.

B. W. COOKE
President
**COYNE TRADE &
ENGINEERING SCHOOL**
1300-1310 W. Harrison St.
Dept. 9359, Chicago, Ill.

Dear Sir:—Please send me free your big catalog and full particulars of your special offer of 2 extra courses.

**SEND
COUPON
TODAY**

Name.....

Address.....

\$258.00 PROFIT EVERY WEEK FOR BERGER



Bentley, of Philadelphia, earned \$215 in one day and Berger, of Ontario, has a standing weekly order that nets him \$258.00 profit every week.

New Kind of Heat!

No dirty, heavy coal to carry and lift—no fires to build, bank or watch—no clouds of ashes to breathe—no heating problems—no cold rooms in winter—no more worry about coal shortage or high prices since the new heating invention.

Big Profits—Quick

Wonderful invention gives three times the heat of coal at turn of valve and burns ordinary kerosene (coal oil). Cheapest fuel there is. No wonder housewives buy on sight. No wonder agents make \$5,000 to \$10,000 a year.

Amazing Invention Pays \$5,000 a Year

OTHERS MAKE FORTUNES

\$215.00 In One Day

"Ye gods—some seller! I made \$215 today," F. W. Bentley, Philadelphia, Pa.

\$11.75 In Ten Minutes

"I took order for a neighbor, \$11.75 profit in ten minutes," Mrs. N. B., Hattiesburg, Miss.

\$43 In One Evening

"I made \$43 last night selling Oliver Burners," N. B., Chelan, Wash.

"Sells Like Beer in a Dry Town"

"Am sending today for 7 Olivers. This is one day's orders (\$85 profit). Selling like beer in a dry town," W. H. Drew, Mich.

Mr. T's 28th Order in Six Months

"Ship 62 Olivers; 10 No. 30; 6 No. 1; 12 No. 2; 24 No. 4," (Mr. T's profit on this order alone is \$713), G. T., Ottawa, Ont.

Russell Earned \$3300 in Six Months

"Have averaged \$660 profit a month for last six months," A. M. Russell, Conn.

Carnegey—

\$1,000 a month
"Am making \$1000 per month. I have made big money before but did not expect so much," J. Carnegey, S. D.

Oliver Oil-Gas Burner and Machine Co.

Dept. 2014-X Oliver Building, St. Louis, Mo.

Please send me full facts about how I can make at least \$5,000 a year representing you in my territory. Also your plan if I just wish to make big money in my spare time.

Name _____

Address _____

NO WONDER this amazing new invention is bringing fortunes to agents. All over the whole country this new device is doing away with old-fashioned methods of heating with coal stoves, ranges and furnaces. Already over \$1,000,000 worth have been sold. You can readily understand why this new invention—the Oliver Oil-Gas Burner—is sweeping over the country like wildfire. It does away with all the expenses and uncertainty of coal when it is almost impossible to get at any price—making every heating stove, cook stove, and furnace a modern oil-gas burner. Saves money, time and drudgery. Three times the heat of any other method. No wonder agents are riding in on the tide of big Oliver profits.

It Sells Itself

Agents find it no work at all to sell this amazing invention—the Oliver new improved Oil-Gas Burner. They just show it—taking only one minute to connect it—then light it. And the sale is made! This new invention is its own salesman. It sells itself! It burns 95% air and only 5% oil—the cheapest fuel there is. It saves a woman work now in times when she is looking for just such things. Just as much or as little heat as wanted, off and on instantly by simply turning a valve.

The Secret of Big Money

Of course, now that you know the facts you yourself can understand why Berger makes \$258.00 profit every week; why F. W. Bentley made \$215.00 in one day. Why J. Carnegey made \$1,000.00 in one month and why hundreds of other agents are cleaning up big too. These men know the secret of big money. They know a good thing when they see it. They know that the time is ripe for this new Oliver improved Oil-Gas Burner.

Big Profits Made Quickly

You, too, can use this secret of big money. You do not need to be a high-powered salesman. We have a definite number of open territories which we are ready to dispose of to those who act quickly. Every territory allotted is filled with big-money opportunities. And this big money comes easily. Because not only does this invention practically sell itself on sight but when you have sold one this one will sell several others as soon as your customer's friends and neighbors see it. And thru our special plan you get credit and commissions for every sale in your territory.

Spare or Whole Time

You can also make big money just by using your spare time. Note how Norton Brown made \$43.00 in one evening.

Coupon Brings Full Offer

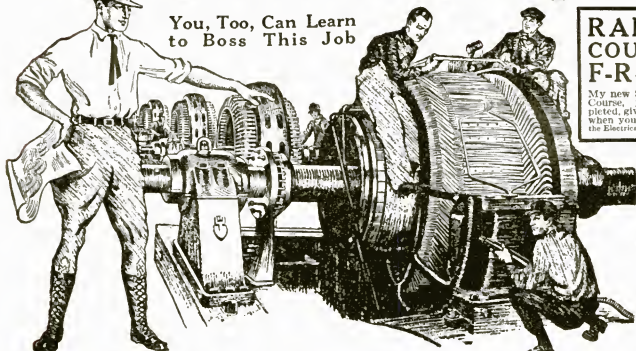
If you want to make at least \$5,000 a year easily, mail this coupon now for our offer. We believe that your common sense will indicate a good proposition to you when you know about it. We want to give you all the facts. Won't you write us? And by doing so quickly you will be allotted an exclusive territory with private selling rights. But mail the coupon at once and clean up on this wonderful new invention.

OLIVER OIL-GAS BURNER AND MACHINE CO.

Dept. 2014-X Oliver Building, St. Louis, Mo.

Be a Certificated "Electrical Expert"

You, Too, Can Learn
to Boss This Job



**RADIO
COURSE
F-R-E-E**

My new \$45 Radio Course, just completed, given FREE when you enroll for the Electrical Course.

"Electrical Experts" Earn \$12 to \$30 a Day WHAT'S YOUR FUTURE

Trained "Electrical Experts" are in great demand at the highest salaries, and the opportunities for advancement and a big success in this line are the greatest ever known.

"Electrical Experts" earn \$70 to \$200 a week. Fit yourself for one of these big paying positions.

Be an "Electrical Expert"

Today even the ordinary Electrician—the "screw driver" kind—is making money—big money. But it's the trained man—the man who knows the whys and wherefores of Electricity—the "Electrical Expert"—who is picked out to "boss" ordinary Electricians—to boss Big Jobs—the jobs that pay.

\$3,500 to \$10,000 a Year

Get in line for one of these "Big Jobs" by enrolling now for my easily learned, quickly grasped, right-up-to-the-minute, Spare-Time Home-Study Course in Practical Electricity.

Age or Lack of Experience No Draw-Back

You don't have to be a College Man; you don't have to be a High School graduate. My Course in Electricity is the most simple, thorough, and successful in existence, and offers every man, regardless of age, education or previous experience the chance to become, in a very short time, an "Electrical Expert," able to make from \$70 to \$200 a week.

I Give You a Real Training

As Chief Engineer of the Chicago Engineering Works I know exactly the kind of training a man needs to get the best positions at the highest salaries. Hundreds of my students are now earning \$3,500 to \$10,000. Many are now successful ELECTRICAL CONTRACTORS.

Your Satisfaction Guaranteed

So sure am I that you can learn Electricity—so sure am I that after studying with me, you, too, can get into the "big money" class in electrical work, that I will guarantee under bond to return every single penny paid me in tuition if, when you have finished my course you are not satisfied it was the best investment you ever made.

FREE—Electrical Working Outfit—FREE

I give each student a Splendid Outfit of Electrical Tools, Materials and measuring Instruments absolutely FREE. I also furnish them with Supplies, examination paper, and many other things that other schools don't furnish. You do PRACTICAL work—AT HOME. You start right in after the first few lessons to WORK AT YOUR PROFESSION in a practical way.

Get Started Now—Mail Coupon

I want to send you my Electrical Book and Proof Lessons both FREE. These cost you nothing and you'll enjoy them. Make the start today for a bright future in Electricity. Send in coupon—NOW.

L. L. COOKE, Chief Engineer,

CHICAGO ENGINEERING WORKS

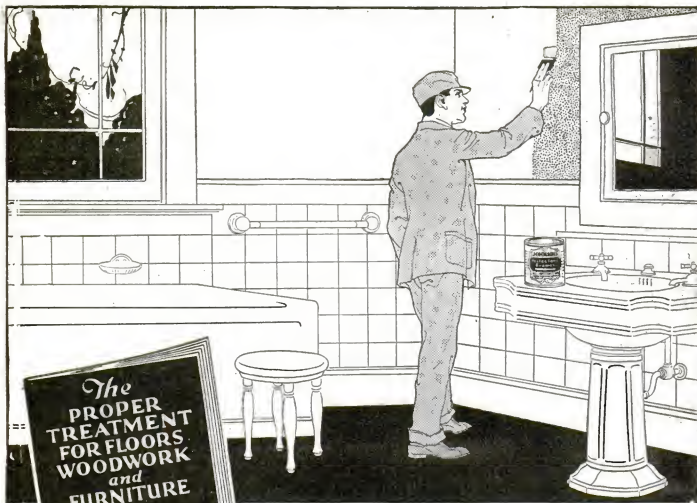
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YOU CAN DO IT

USE THIS "FREE OUTFIT" COUPON

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Address _____
Occupation _____

L. L. COOKE,
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Chicago, Ill.
Dear Sir: Send at once Sample Lessons, your Big Book, and full particulars of your Free Outfit and Home Study Course, the Free Radio Course—all fully prepaid, without obligation on my part.



This Beautiful Book on Wood Finishing **FREE**

GIVES complete instructions for finishing all wood—hard or soft, old or new. Explains just what materials to use and how to apply them. Tells how inexpensive soft woods may be finished so they are as beautiful and artistic as hard wood. This book is the work of experts—illustrated in color. Gives covering capacities, includes color charts, etc.

JOHNSON'S ENAMEL

Johnson's Perfectone Undercoat and Enamel is the ideal finish for wood, plaster and metal. It will not chip, check, crack, peel or change its color. Gives a beautiful, germ-proof porcelain-like finish which is impervious to hot soapy water, iodine, ammonia, etc.

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Fill out and mail coupon for a free copy of "The Proper Treatment for Floors, Woodwork and Furniture."

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"The Wood Finishing Authorities"

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Canadian Factory—Brantford



FREE

Brings This
Richly Upholstered
6-Piece Suite
Chairs Have Spring Seats
Send only \$1 for this complete suite
of 6 splendid pieces. Use it 30 days,
then if not satisfied, ship it back
and we will return your \$1 and
pay transportation charges both
ways. If you keep it, take

Nearly a Year to Pay

on our easy terms. Table scarf and candlesticks are FREE. The suite, consisting of table, 36-inch x 23-inch top, 2 rockers, 2 chairs and waste basket, made of selected quarter-sawn and solid oak. Very solidly built. Fumed oak finish. Chairs and rockers upholstered in imitation Spanish brown leather and have padded, spring seats and cut-out panels in back. All roomy, full size pieces. Shipped (fully boxed, "knocked down") to lessen freight charges) from factory in Indiana or Chicago warehouse. Order by No. 105DDMA18. Price \$34.95. Send \$1.00 now. Balance \$3 monthly. Table Scarf and Candlesticks are FREE.

FREE Beautiful Velour Table Scarf—2 Candlesticks to Match Set

We want to prove that Hartman's prices and terms are the most liberal ever known. That is why we make this extra inducement. A handsome 48 in. x 16 in. blue velour table scarf with floral tapestry ends and gold braid binding; also 2 solid oak candlesticks to match furniture **ABSOLUTELY FREE!** No other offer like this. Send quick!

Send Post Card for 368-Page Free Bargain Catalog

This 368-page book offers the world's greatest bargains in furniture, rugs, silverware, kitchenware, etc., also farm machinery—all sold on our easy monthly payment terms and on 30 days' free trial.

Also explains how you can get absolutely FREE with purchases, fine sets of Glassware, Dishes, Lemonade Sets, Silverware, Tablecloths, Napkins and other elegant and useful articles. Send postal for it today.

"Let Hartman Feather YOUR Nest"



HARTMAN Furniture & Carpet Co.
Dept. 4970
Chicago, Illinois

Enclosed find \$1 as first payment. Send the 6-piece Living Room Suite No. 105DDMA18 and with it, absolutely FREE, the beautiful Table Scarf and Candlesticks, all as described. I am to have 30 days' free trial. If not satisfied, will ship all back and you will return my \$1 and pay freight both ways. If I keep it, I will pay \$3 monthly on the suite alone until the full price, \$34.95, is paid. Title remains with you until final payment is made.

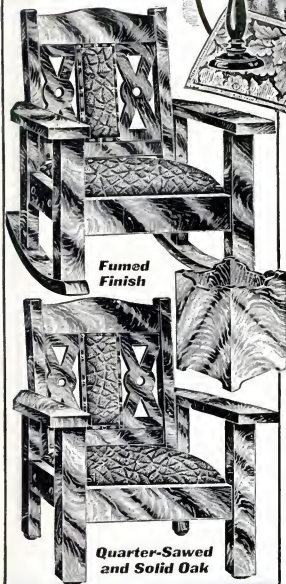
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Fumed Finish

Quarter-Sawn and Solid Oak

HARTMAN FURNITURE & CARPET CO.
Dept. 4970 Chicago, Ill.

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—and now
harmony replaces discord!

MUSIC—clear as a bell; speech—every word is marvelously distinct; jazz—uninterrupted syncopation; opera—with full-toned quality and beauty in strong relief.

Clear radio reception is a matter of *batteries*. Elimination of most *noises* is a matter of batteries, rather than static or other interference.

Irregular voltage output, natural in ordinary "B" batteries, causes noises. Unvarying current output stops these noises—and this marvelously clear and life-like reception results.

Because RADIOBATS "A" and "B" are the only batteries *able to act correctly*, we urge you to

listen to a demonstration at your dealer's.

There is *no* way to hear such reception till these new-principle batteries are hooked in.

RADIOBATS "B"—as well as "A"—are *leak-proof* because they have the only solid electrolyte; and are more economical, because, like "A" Batteries, they are indefinitely *rechargeable at home*.

Send your dealer's name and address that we may arrange an immediate demonstration.

Multiple Storage Battery Corporation
350-B Madison Avenue, New York

Send for this intensely
informative book. It is
absolutely **FREE**.



Equip your set with "A" and "B"

RADIOBATS

The Permanent Radio Power-UNIT